JUL 5 - 1935

The Time of the Portland Meeting of the AMERICAN PHARMACEUTICAL ASSOCIATION Is Fast Approaching—Make Your Plans for the Trip; Authors of Papers Should Submit the Titles if They Are Not Ready to Send in the Completed Papers.

Vol. XXIV, No. 6 JUNE, 1935

JOURNAL
OF THE
AMERICAN PHARMACEUTICAL ASSOCIATION

TRADE MARK

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THE 83rd ANNUAL MEETING OF THE AMERICAN PHARMACEUTICAL ASSOCIATION WILL BE HELD IN PORTLAND, ORE., AUGUST 5–10, 1935.

Local Secretary, A. O. Mickelsen, N. E. 6th Ave. at Oregon St., Portland, Ore., Hotel Multnomah, Headquarters.

The 1935 Meetings of the American Association of Colleges of Pharmacy, the National Association of Boards of Pharmacy, Conference of Pharmaceutical Association Secretaries, of the Pharmaceutical Law Enforcement Officials and the Plant Science Seminar will also be held in Portland.

Entered as second-class Matter, January 23, 1917, at the Post Office at Easton, Pa., under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103. Act of October 3, 1917; authorized July 10, 1918.

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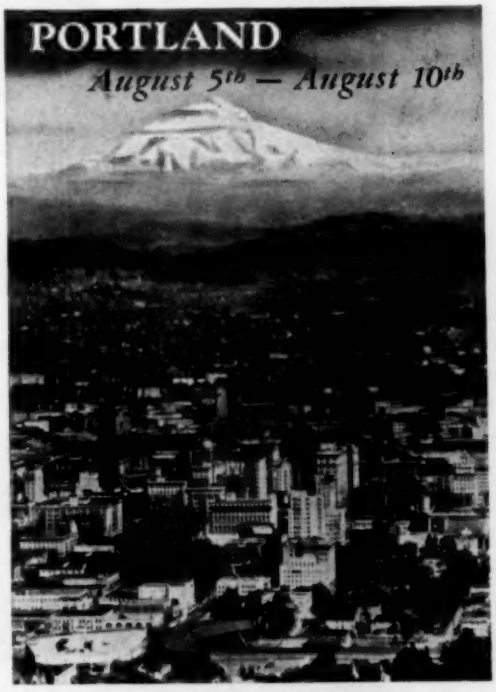
NEARER AND NEARER TO CONVENTION TIME.

PLAN YOUR TRIP TO PORTLAND.

The time for the annual meeting of the AMERICAN PHARMACEUTICAL ASSOCIATION, August 5th–10th, is fast approaching and a most elaborate program has been arranged. Partial programs are published in this issue of the JOURNAL.

F. C. Felter, of the Publicity Committee, says that the AMERICAN PHARMACEUTICAL ASSOCIATION, with "A Pharmaceutical Air," will descend upon Portland, Ore., August 5th to 10th, when pharmacists from all corners of the United States take over the City of Roses and literally transform it into a "City of Mortars and Pestles."



Portland, the Convention City, with Mt. Hood in the Background.

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See also Advertising Section of the JOURNAL for April, page VII; May JOURNAL, pages IX, XVIII and XXIV, and other references in this issue of the JOURNAL.

FRANK H. EBY.

JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION

VOL. XXIV JUNE, 1935 No. 6

THE CHAIRMAN OF THE PLANT SCIENCE SEMINAR.

Frank H. Eby, chairman of the Plant Science Seminar, 1934–1935, was born in Lancaster County, Pa., in 1896, a few miles from where his early Pennsylvania Dutch ancestors settled in 1715. Here he received his early education and also served his first years of apprenticeship in pharmacy. Later, he was employed in the stores of George B. Evans and William J. Pechin of Philadelphia. In 1919, he received his diploma from the School of Pharmacy of Temple University and, in 1921, he was awarded the degree of Doctor in Pharmacy from the same institution.

Professor Eby has been a member of the faculty of Temple University since 1920 and at present is professor of Botany and Pharmacognosy in the School of Pharmacy.

He served as secretary of the Philadelphia Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION in 1929–1930 and as president of the Branch in 1933–1934. He is a member of the Pennsylvania Pharmaceutical Association and has held membership on a number of committees of this organization; at present he is chairman of the Committee on Biology and Pharmacognosy. He is a member of the Committee on Materia Medica, Boards of Pharmacy and Colleges of Pharmacy, District No. 2.

During the World War Mr. Eby served as a pharmacist in the Navy. He is past-commander of the local Legion post, a member of the Blue Key Fraternity, Kappa Psi Pharmaceutical Fraternity and has always taken an active part in Boy Scout affairs.

Professor Eby married Dorothy M. Keller of Harrisburg in 1921; they have one son.

Officers of the Plant Science Seminar: *Chairman*, Frank H. Eby; *Vice-Chairman*, L. K. Darbaker; *Secretary-Treasurer*, F. J. Bacon; *Executive Committee*, C. E. F. Mollett, E. B. Fischer. Founded 1925, *Founder*, E. L. Newcomb.

EDITORIAL

E. G. EBERLE, EDITOR 2215 Constitution Ave., WASHINGTON, D. C.

THE INTERNATIONAL CONGRESS OF PHARMACY.

PRESIDENT GENERAL R. PATTOU of the International Congress of Pharmacy has advised that he will occupy himself with the questions of a professional nature concerning the free choice of pharmacists for organized pharmaceutical services. He desires to be advised as to how in the United States are pharmacists designated for furnishing medical supplies to organized services?

By "organized services" he understands those which are organized with the intervention:

(*a*) Of the *Public Authorities:* The Federal Government, States, Municipalities.

(*b*) Of *Social Insurance Institutions.*

(*c*) Of *Mutual Aid Societies.*

(*d*) Of *Companies Insuring against Industrial Accidents.*

(*e*) Of any other organizations.

He also desires to know whether all established pharmacists are authorized as a matter of right to have a part in furnishing supplies, in case certain conditions must be met in order to engage in furnishing supplies, what they are and what the opinion is of the pharmaceutical profession in the United States on the subject of free choice of pharmacists.

Comment has been made on the International Congress of Pharmacy in prior issues of the JOURNAL. The general secretary is J. Breugelmans, pharmacist of Brussels.

THE EIGHTH INTERNATIONAL CONGRESS OF MILITARY MEDICINE AND PHARMACY.

THE Eighth International Congress of Military Medicine and Pharmacy will be held at Brussels, Belgium, from June 27 to July 3, 1935. The change of place from Bucharest to Brussels was made on account of the death of Prof. Butoianu, Surgeon General of the Roumanian Army.

The Seventh Congress, held at Madrid in 1933, proposed the following topics which will be considered at the forthcoming Congress:

1. "Principles of Organization and Function of the Medical Service in Mountain Warfare." Reporters: Roumania and Italy.

2. "Determination of Aptitude for the Various Specialties in the Medical Services of the Army, Navy and Air Force." Reporters: Roumania and France.

3. "Sequelæ of Wounds of the Abdomen." Reporters: Roumania and the United States.

4. "Researches Concerning Standardization of Methods of Analysis of Foods and Drinks for the Use of the Soldier." Reporters: Roumania and Czechoslovakia.

5. "Buccal-Dental Prophylaxis at the Front." Reporters: Roumania and Lithuania.

6. "Comparative Study of the Medical Administrative Services of Various Armies, Navies and Air Services." Reporters: Roumania and Chile.

The Brussels Congress will doubtless be as important and interesting as those which have gone before it. As Roumania was to have entertained the Congress, each discussion, in keeping with the usual custom, is opened by representatives of Roumania. Information regarding the meeting may be had from the Secretary of the Association of Military Surgeons of the United States, Army Medical Library, 7th and B Sts., Washington, D. C.

These data were obtained through courtesy of *The Military Surgeon* of June 1935.

PHARMACISTS AND PUBLIC HEALTH SERVICE.

PHARMACISTS have an important part in public health service and first aid, represented not only in bringing medical attention to the injured and suffering, but in supplying materia medica which will afford relief and prevent spread of disease. An unusual case, in Washington, within the past month, presents several phases. Two young men, a freshman at George Washington University and a Government employee, were on a hike on the Chesapeake and Ohio Canal tow-path —when the former was bitten by a copperhead. Fortunately, the snake was seen and the danger recognized, but strange to say, neither of the young men had a pocket-knife. Safety prompted the use of nature's provision (the teeth) in opening the wound and bringing about flow of blood, and further comradeship was shown in the act of carrying the crippled man a distance of two miles. The purpose of this comment follows.

Interns treated the wound with an antiseptic and, later, the young man was discharged and returned home; soon the leg began to swell. The boy's father, a chemist, called the family doctor, who advised that because snake-bites are rare, he was not informed relative to efficient treatment. Dr. William F. Mann, director of the Zoo, advised the injection of a serum which was supplied by a well-known professional pharmacy; the injection was given and the young man's life saved. The unusual occurrence brought difficulties and, throughout, the finest coöperation; this is a purpose of the comment and presents several thoughts from which lessons may be drawn.

Bites and stings are vacation handicaps and so are the effects of contact with poisonous plants, and it is the pharmacist's duty to supply the means of relief and the antidotes, and therefore, inform himself relative to the best means of service. The Ohio State Division of Conservation broadcasts information on ivy poisoning and as a preventive suggests the use of the wash devised by Dr. J. B. McNair—a 5 per cent solution of ferric chloride in a 50–50 mixture of water and glycerin. The exposed parts of the skin are washed with the preparation and allowed to dry; the iron in the latter combines with the poison and prevents its ill-effects.

It is advisable to destroy the poison of the plant or insect; for bites, the general rule may be laid down to neutralize the poison, usually of an acid nature; soothe, don't scratch. Breeding places for mosquitoes and other insects are a menace, their activities are dangers to public health.

This comment is for pointing to the pharmacists' place in health service.

SCIENTIFIC SECTION

BOARD OF REVIEW OF PAPERS.—*Chairman*, F. E. Bibbins, George D. Beal, L. W. Rising, H. M. Burlage, L. W. Rowe, John C. Krantz, Jr., Heber W. Youngken.

DRUG EXTRACTION. II. THE EFFECT OF FINENESS OF POWDER AND OF VARIATION IN SOLVENTS ON THE PERCOLATION OF BELLADONNA ROOT.[1,2]

BY WILLIAM J. HUSA[3] AND C. L. HUYCK.[4]

In connection with the general study of the fundamental principles of drug extraction which is being carried out in the Department of Pharmacy of the University of Florida it seemed desirable to investigate the extraction of a series of drugs of different types. Belladonna root was selected as representing a simple type of plant structure containing alkaloids as the active constituents. The work reported in this paper covers research on the swelling of belladonna root in various solvents and the effect of fineness of powder and variation in solvents on the percolation of belladonna root.

EXPERIMENTAL PART.

Materials Used.—Except where otherwise specified, the belladonna root used was from the 125-lb. shipment previously described (1). A thorough pharmacognostic study was made and it was found that the shipment conformed to the U. S. P. description.

Swelling of Strips.—Using the technique (1) of making measurements with a filar micrometer of the width of thin strips of cross sections before and after the addition of solvents, the swelling of the wood of belladonna root in various liquids was determined. Cross sections 0.10 to 0.15 mm. thick were cut by means of a sharp carpenter's plane. The results, which in each case are the average of several determinations, have been expressed on a percentage basis, taking the width of the dry strips as 100.

TABLE I.—THE EFFECT OF ALCOHOL-WATER MIXTURES ON THE WOOD OF BELLADONNA ROOT.

Vol. of Alcohol.	Vol. of Water.	Average Width of Strips of Cross Sections (Dry = 100) after Time Intervals in Minutes. 0.	1.	3.	10.	20.	40.	60.	90.
0	1	100	110	109	110	110	110	113	112
1	3	100	110	109	109	110	110	112	110
1	2	100	106	105	109	111	111	111	112
1	1	100	105	105	105	106	106	106	
3	2	100	102	101	102	102	103	104	103
7	3	100	102	101	102	102	104		
4	1	100	101	101	101	101	103	103	
5	1	100	101	101	102	102	102	101	101
9	1	100	101	102	102	102	102	102	
1	0	100	101	100	100	100	100		

Table I shows that a mixture of 1 vol. of alcohol and 3 vol. of water gave the same swelling curve as water alone. As the percentage of alcohol increased there was an increasing tendency to-

---

[1] Scientific Section, A. PH. A., Washington meeting, 1934.

[2] This paper is based on a thesis presented to the Graduate Council of the University of Florida by C. L. Huyck, in partial fulfilment of the requirements for the degree of Master of Science in Pharmacy.

[3] Head Professor of Pharmacy, University of Florida.

[4] Graduate Scholar, University of Florida, 1932–1933.

ward a smaller primary swelling and a smaller total swelling during the period of the test. Alcohol has practically no effect of swelling or shrinking on the wood of belladonna root. Tests made with drug from another shipment gave similar results with the exception that the initial swelling in water was about 30% instead of 10%. It seems likely that the percentage swelling may vary according to the age of the root and the extent to which it has been dried. According to Gortner (2) bio-colloids show a decrease in imbibition capacity with age, old plant tissues being in general less highly hydrated than are the younger tissues.

TABLE II.—THE EFFECT OF GLYCERIN–WATER MIXTURES ON THE WOOD OF BELLADONNA ROOT.

Vol. of Glycerin.	Vol. of Water.	Average Width of Strips of Cross Sections (Dry = 100) after Time Intervals in Minutes. 0.	1.	5.	10.	30.	60.	90.	120.
1	0	100	100	100	101	103	104	105	106
4	1	100	103	103	105	108	108	108	108
3	2	100	105	106	106	107	107	107	107
1	1	100	108	108	108	108	108	109	109
1	3	100	108	110	110	110	110	111	112
1	7	100	108	109	109	110	110	110	110

The above results indicate that glycerin causes a gradual swelling of the wood of belladonna root, amounting to 6% in two hours. With increasing proportions of water, the primary rise increases and there is a more rapid approach to equilibrium.

TABLE III.—THE EFFECT OF GLYCERIN–ALCOHOL MIXTURES ON THE WOOD OF BELLADONNA ROOT.

Vol. of Glycerin.	Vol. of Alcohol.	Average Width of Strips of Cross Sections (Dry = 100) after Time Intervals in Minutes. 0.	1.	3.	30.	60.	120.
9	1	100	101	101	102	103	106
4	1	100	100	100	101	103	105
3	2	100	99	99	101	103	105
1	1	100	97	97	98	99	100
1	3	100	99	98	99	99	102
1	7	100	99	99	99	100	100

As to the effect of alcohol–glycerin mixtures on the swelling of belladonna root it may be said that the swelling in a mixture of these liquids is practically an average of the effects of the liquids themselves when allowance is made for the relative proportions of the two liquids in the mixture.

The Effect of the Fineness of Powder on the Percolation of Belladonna Root.—100 Gm. portions of belladonna root in Nos. 20, 40, 60 and 80 powders were percolated by the U. S. P. process for the fluidextract, 80 cc. of reserve percolate being set aside in each case and the further percolate being collected in successive 100-cc. portions.

Numerous tests were carried out to determine the amount of menstruum necessary to render powdered belladonna root "evenly and distinctly damp" as specified in the U. S. P. Naturally this would vary with different samples of drug according to moisture content. For the drug used in this experiment containing about 10% moisture, 90 cc. of menstruum seemed right for moistening 100 Gm. of drug. Accordingly this amount of menstruum (alcohol 5 vol.—water 1 vol.) was used for moistening each 100-Gm. portion of drug, and the drug macerated for six hours. The drug was then packed in the percolators as uniformly as possible, and, following the U. S. P. directions, macerated for 48 hours. The reserve portions of 80 cc. were then collected at the rate of 10 drops per minute, and then four successive 100-cc. portions were collected at the rate of 20 drops per minute. Wherever it was neces-

sary to stop the percolation for a few hours, such as over night, the time factor was held constant for each portion of drug.

The various fractions of percolate were assayed for total alkaloids and total extractive.

TABLE IV.—EFFECT OF FINENESS OF POWDER ON PERCOLATION OF BELLADONNA ROOT. GM. OF ALKALOID IN VARIOUS PORTIONS OF PERCOLATE.

Percolate.	No. 20 Pwd.	No. 40 Pwd.	No. 60 Pwd.	No. 80 Pwd.
80 cc.	0.301	0.307	0.305	0.300
100 cc.	0.109	0.149	0.160	0.160
100 cc.	0.015	0.027	0.016	0.019
100 cc.	0.001	0.009	0.003	0.004
100 cc.	0.002	0.003	0.002	0.002
Total	0.428	0.495	0.486	0.485
	Gm. Total Extractive in Various Portions of Percolate.			
80 cc.	6.91	6.73	8.27	7.46
100 cc.	6.76	6.70	7.23	7.49
100 cc.	3.52	3.88	4.47	4.73
100 cc.	1.83	1.95	3.10	2.42
100 cc.	0.86	1.05	1.90	0.91
Total	19.88	20.31	24.97	23.01

The results in Table IV indicate that within the limits of No. 20 and No. 80 powder, the fineness of powder is of minor importance as to its effect on rate of extraction of alkaloids by percolation. In each case the amount of alkaloid beyond the third percolate was comparatively unimportant. The data as to total extractive agree with the previous findings (1) that the yield of total extractive increases as the size of powder decreases down to and including No. 60 powder and that with the No. 80 powder there is a decrease in yield of total extractive.

No extensive work has previously been done on the relation of the fineness of powder to the extraction of belladonna root. At the present time the British Pharmacopœia uses a No. 22 powder and the U. S. P. specifies a No. 40 powder.

The Effect of Variation of Solvents on the Percolation of Belladonna Root.—100-Gm. portions of belladonna root in No. 40 powder were percolated by the U. S. P. process for the fluidextract but using various alcohol–water mixtures in two series of percolations. In each case 80 cc. of reserve percolate were set aside and the further percolate collected in successive 100-cc. portions. The amount of moistening liquid used was 90 cc. for each 100-Gm. portion of drug.

TABLE V.—PERCOLATION OF BELLADONNA ROOT WITH VARIOUS ALCOHOL–WATER MIXTURES.

(FIRST SERIES.)

	Gm. Alkaloid in Various Fractions of Percolate.				
Percolate.	Alcohol.	Alc. 95 Vol.— Water 5 Vol.	Alc. 9 Vol.— Water 1 Vol.	Alc. 7 Vol.— Water 1 Vol.	Alc. 5 Vol.— Water 1 Vol.
80 cc.	0.154	0.159	0.172	0.265	0.296
100 cc.	0.095	0.186	0.201	0.122	0.175
100 cc.	0.011	0.015	0.014	0.007	0.015
100 cc.	0.002	0.002	0.002	0.003	0.001
100 cc.	0.001	0.001	0.001	0.001	0.000
Marc	0.122	0.033	0.004	0.005	0.000
Total	0.385	0.396	0.394	0.403	0.487

Gm. Total Extractive in Various Fractions of Percolate.

80 cc.	3.22	3.47	4.31	6.37	7.10
100 cc.	1.25	3.31	6.01	6.10	8.46
100 cc.	0.65	1.88	3.49	3.79	3.59
100 cc.	0.55	1.61	2.36	1.86	1.66
100 cc.	0.57	2.10	2.36	1.35	0.92
Total	6.24	12.37	18.53	19.47	21.73

TABLE VI.—PERCOLATION OF BELLADONNA ROOT WITH VARIOUS ALCOHOL–WATER MIXTURES.

(SECOND SERIES.)

Gm. Alkaloid in Various Fractions of Percolate.

Percolate.	Alc. 5 Vol.—Water 1 Vol.	Alc. 4 Vol.—Water 1 Vol.	Alc. 7 Vol.—Water 3 Vol.	Alc. 1 Vol.—Water 1 Vol.	Alc. 1 Vol.—Water 2 Vol.
80 cc.	0.295	0.241	0.303	0.304	0.233
100 cc.	0.164	0.182	0.153	0.158	0.186
100 cc.	0.006	0.001	0.021	0.040	0.019
100 cc.	0.000	0.001	0.001	0.001	0.002
100 cc.	0.000	0.000	0.000	0.000	0.001
Total	0.465	0.425	0.478	0.503	0.441

Gm. Total Extractive in Various Fractions of Percolate.

80 cc.	6.59	7.06	9.51	14.20	16.09
100 cc.	7.66	8.41	10.99	10.95	12.46
100 cc.	3.45	3.47	2.71	2.48	0.81
100 cc.	1.63	1.26	1.12	0.33	0.19
100 cc.	1.05	0.66	0.61	0.11	0.14
Total	20.38	20.86	24.94	28.07	26.69

The results in the preceding tables indicate that as the alcoholic strength of the menstruum decreases, extraction of alkaloids becomes more rapid and the yield of extractive becomes greater. It is evident that the four highest alcoholic strengths used do not make good menstrua for belladonna root. The next four proportions, *i. e.*, alcohol 5 vol.—water 1 vol., alcohol 4 vol.—water 1 vol., alcohol 7 vol.—water 3 vol., alcohol 1 vol.—water 1 vol., have approximately the same efficiency, resulting in extraction of substantially all of the alkaloid. As far as our present results go the official menstruum for the U. S. P. fluidextract appears to be well chosen. The results of the U. S. P. menstruum (Alcohol 5 vol.—Water 1 vol.) carried out two different times in the two different series of percolations agree fairly well. This indicates that the two series of percolations are comparable and that no important differences have arisen from differences in conditions such as temperature, degree of packing and time consumed in percolation. The discrepancy in the total alkaloid shown in case of the higher percentages of alcohol has previously been investigated and explained (1).

DISCUSSION OF RESULTS.

Water caused an immediate swelling of thin strips of the wood of belladonna root, the swelling curves being of the same type as those observed in case of thin strips of chestnut wood (1). The results of the tests of alcohol–water mixtures on

the wood of belladonna root are fully comparable with the results on chestnut wood on the more aqueous mixtures. With the more highly alcoholic liquids there is less swelling in the case of belladonna wood than in the case of chestnut wood. It would seem that woody tissues may differ more in behavior to alcohol than to water. The effects of mixtures of liquids on the swelling of the wood of belladonna root are in accord with previous conclusions that the effect of a mixture of two liquids is practically an average of the effects of the liquids themselves when allowance is made for the relative proportions. It is noteworthy that glycerin causes considerable swelling of the belladonna wood in two hours (60% as much as caused by water) whereas glycerin causes only a very slight swelling of chestnut wood (5% as much as caused by water). It should be noted that alcohol had exactly the reverse effect, causing no swelling in the case of belladonna wood but giving considerable swelling with chestnut wood (75% as much as caused by water). The opposite behavior of the two liquids with the two kinds of woody tissue is an example of a principle of colloidal chemistry, *i. e.*, that the swelling of gels is a process of highly selective character. Each gel shows an ability to take up a certain particular liquid (3). Further study of the swelling of drugs should lead to a better understanding of the fundamental principles involved and of their significance in the processes of drug extraction.

The results on percolation of belladonna root with alcohol-water mixtures are in general agreement with the work of Farr and Wright (4). A search of the literature shows that alcohol alone has not been favored as a menstruum for this drug, the trend having been toward the use of 50% to 85% alcohol.

SUMMARY.

A study has been made of the swelling of the wood of belladonna root in binary mixtures of water, alcohol and glycerin. Percolation tests show that within the limits of No. 20 and No. 80 powder, the finess of powder is of minor importance in the extraction of belladonna root. By a series of percolations of belladonna root, using various alcohol-water mixtures, it was found that mixtures ranging from alcohol 5 vol.—water 1 vol. to alcohol 1 vol.—water 1 vol. give the best results.

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(1) William J. Husa and Louis Magid, JOUR. A. PH. A., 23, 891 (1934).

(2) Gortner, "Outlines of Biochemistry," John Wiley and Sons, Inc., New York, 1929, pages 223, 563.

(3) Ware, "Chemistry of the Colloidal State," John Wiley and Sons, Inc., New York, 1930, pages 250–252.

(4) Farr and Wright, *Pharm. J.*, 74, 546 (1905).

COMPARATIVE STUDIES ON THE UTILIZATION OF DIFFERENT MAGNESIUM SALTS.*

BY J. C. FORBES AND F. P. PITTS.

Although considerable work has been done on magnesium metabolism little data are available concerning the relative utilization of the naturally occurring

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magnesium compounds of foodstuffs as compared with the lactate and citrate and the inorganic magnesium compounds. Contrary to the usual conception certain magnesium salts are apparently well absorbed from the intestinal tract. Hirschfelder and Haury (1) found on an average in man 42.6 per cent of a purgative dose of Epsom salt excreted in the urine in 24 hours. Carswell and Winter (2) fed 8 Gm. of magnesium lactate to adult men and found approximately 50 per cent absorbed. Barbour and Winter (3) conclude that dogs absorb magnesium lactate and gluconate far more readily than magnesium oxide.

The purpose of the present investigation was to determine if the magnesium compounds of natural foodstuffs differed in their absorption and utilization from the lactate and chloride, young white rats being used as experimental animals. Calcium and phosphorus balances were carried on at the same time as the magnesium studies and in several cases the effect of marked dietary alkalinity on the utilization of these elements was studied. The calcium, phosphorus and magnesium concentrations of the various diets were kept relatively constant, the calcium concentration being approximately 450 mg., phosphorus 500 mg. and magnesium 240 mg. per 100 Gm. of ration.

Diets.—All of the diets with the exception of that used in experiment Number 4 were prepared from the following stock diet.

Yellow corn meal	710 Gm.
Meat meal	100 Gm.
Dried milk	50 Gm.
NaCl	5 Gm.
KCl	2.5 Gm.
Small amount of iron and trace of KI	

Dicalcium phosphate or calcium inosite-hexaphosphate (a commercial preparation known as calciphos being used) was added to this stock diet to give an adequate calcium and phosphorus content. Magnesium lactate or chloride was added to supply the magnesium. Wesson oil to the extent of 10 per cent of the diet was added to increase the fat content. In some cases sodium carbonate to the extent of 2 per cent was also added. The diet used in experiment Number 4 was made up as follows, alfalfa and linseed meal supplying most of the magnesium content.

Yellow corn meal	1000 Gm.
Meat meal	200 Gm.
Alfalfa	200 Gm.
Linseed meal	600 Gm.
Calcium lactate to give an adequate calcium concentration.	

During the experimental period the rats, two per cage, were kept in round metabolism cages beneath which was a wire gauze and glass funnel to collect feces and urine, respectively. The separation of urine and feces was, as a rule, quite complete but a small amount of spattered food was usually present in the urine. The collection of urine and feces was made at weekly intervals. The supporting funnel was always washed down with dilute hydrochloric acid and water so as to dissolve any precipitated salts, the washings being added to the urine. Distilled water was given at will and five drops of cod liver oil fed daily per cage.

Methods of Analysis.—Food and feces analyses were carried out by Morris, Nelson and Palmer's method (4). Urines were always acidified, when necessary, diluted to a definite volume, and aliquots taken for calcium and phosphorus analysis. Urine magnesium determinations were carried out on the calcium supernatant fluid in exactly the same manner as used for food and feces.

Remarks.—Experiment No. 1.—Diet contained $CaHPO_4$ and Mg lactate, Ca:P:Mg ratio was 1:1.066:0.593.

TABLE I.—UTILIZATION OF Ca, P AND Mg BY RATS.

Expt. No.	Cage.	Duration, Weeks.	Av. Gain per Week, Gm.	Average Daily Intake, Mg. Ca.	P.	Mg.	Average Daily Retention. Mg. Ca.	P.	Mg.	Per Cent. Ca.	P.	Mg.	% Mg Absorbed.
1	1	6	17	43	46	25	26	22	7.0	60	48	28	39
	2	6	20	45	48	27	31	22	7.6	69	46	28	41
2	1	5	18	43	45	19	29	24	3.5	67	53	18	30
	2	5	13	36	38	16	25	20	3.7	69	53	23	34
	3	5	12	46	48	20	28	21	3.4	61	44	17	31
3	1	6	21	42	45	25	22	19	5.1	52	42	20	30
	2	6	22	45	48	27	26	19	5.9	58	39	22	35
4	1	6	15	55	57	27	21	28	6.2	38	49	23	31
	2	6	14	58	60	28	22	31	6.8	38	50	24	30
5	1	5	25	55	59	31	32	35	5.4	58	59	17	29
	2	5	19	45	48	26	29	18	4.7	64	37	16	30
	3	5	17	46	49	27	29	18	4.7	63	36	16	30

Experiment No. 2.—Diet similar to Experiment No. 1, except that Ca:P:Mg ratio was 1:1.055:0.445. Same as in cages 1 and 2, plus 2 per cent Na_2CO_3.

Experiment No. 3.—Diet contained $CaHPO_4$ and $MgCl_2$, Ca:P:Mg ratio was 1:1.066:0.595.

Experiment No. 4.—Alfalfa and linseed meal diet, Ca:P:Mg ratio was 1:1.036:0.490.

Experiment No. 5.—Calcium inosite-hexaphosphate and Mg lactate diet, Ca:P:Mg ratio was 1:1.074:0.580. Experiment No. 6.—Same as foregoing, plus 2 per cent Na_2CO_3.

CONCLUSIONS.

It will be seen from Table I, which records the average weekly determinations of calcium, phosphorus and magnesium retention, that,

1. The different magnesium compounds used do not differ materially in either absorption or utilization. The variation in average daily retention is apparently not significant, since the greatest and least retentions were obtained with the same magnesium salt, Experiments 1 and 2.

2. The magnesium absorption, as measured by the sum of the urinary and retained magnesium, averaged 32.5 per cent of the intake, and varied between the limits of 29 and 41 per cent.

3. Carswell and Winter (2) have shown that after oral administration of magnesium lactate one may obtain either high calcium, low magnesium or low calcium, high magnesium retentions. Therefore, it is probable that the apparent effect of the naturally occurring magnesium compounds in linseed meal and alfalfa to produce a low calcium, high magnesium retention is not due to any difference of behavior of these compounds from that of the others.

4. Addition of sodium carbonate to the diet to the extent of 2 per cent had no unfavorable effect on the utilization of calcium, phosphorus or magnesium.

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THE ARSENAMIDES. COMPOUNDS CONTAINING THE As-N LINKAGE.*,[1]

BY G. O. DOAK.

The reaction between arsenous halides and amines has been investigated by several workers with rather conflicting results. Thus Leeds (1), Landau (2), Schiff (3), Leonard (4), and Schmidt (5) all obtained compounds of the type $3RNH_2.AsX_3$. The latter three assigned structural formulas to these compounds, regarding them as substituted ammonium halides, $As{\equiv}(NH_2RX)_3$. On the other hand Anschutz and Weyer (6) obtained compounds of the type $X_2As\text{-}NHR$ and $XAs{=}(NHR)_2$, by using aniline and arsenous chloride and bromide. They could not obtain the compounds obtained by Landau and Schiff and believed these workers had been dealing with impure mixtures. Similarly Michaelis and Luxembourg (7) obtained $Cl_2AsN(C_4H_9)_2$ from diisobutylamine and arsenous chloride. Substituted arsenous halides and amines have also been investigated and yield similar products. Michaelis obtained $Cl(C_6H_5)As{-}NHC_4H_9$ and $Cl(C_6H_9)AsN\text{-}(C_4H_9)_2$ from phenyl dichlorarsine and butylamine and dibutylamine (8). With triethylamine Michaelis obtained a product to which he assigned the formula $Cl_2(C_6H_5)As{=}N(C_2H_5)_3$. With ammonia he obtained the imide $C_6H_5As{=}NH$. Hugot had previously obtained an amide $As(NH_2)_3$ from arsenous chloride and ammonia which gave the imide $As_2(NH)_3$ on heating (9). Ipatiew, Rasuwajew and Stromski (10) obtained $(C_6H_5)_2AsNH_2$ from diphenyl chlorarsine and ammonia.

From the work described in the present paper the reaction appears to be more complex than the previous work showed, and the conflicting results are due to the failure of the previous workers to isolate all the products of the reaction. Thus in nearly all the reactions studied, two or more products have been obtained or indicated. The reaction between an arsenous halide and an amine takes place according to the following equations:

1. $AsX_3 + RNH_2 \longrightarrow X_2As.NHR.HX.$
2. $X_2AsNHR.HX + RNH_2 \longrightarrow X_2AsNHR + RNH_2.HX.$
3. $AsX_3 + 2RNH_2 \longrightarrow XAs(NHR.HX)_2.$
4. $XAs(NHR.HX)_2 + 2RNH_2 \longrightarrow XAs(NHR)_2 + 2RNH_2.HX.$
5. $AsX_3 + 3RNH_2 \longrightarrow As(NHR.HX)_3.$

The course of the reaction is influenced by several different factors, namely: the order of mixing, strength of the base and the arsenous halide used. Certain steric effects also seem to influence the course of the reaction. When a *n*-heptane solution of aniline was added to a *n*-heptane solution of arsenous chloride, an 84.75 per cent yield of $As(NHC_6H_5.HCl)_3$ was obtained, identical with the product obtained by Schmidt. When the order of mixing was reversed, a 33.56 per cent yield was obtained, and $Cl_2AsNHC_6H_5$ was isolated in considerable amounts from the heptane filtrate. Monomethylaniline gave only a 14.32 per cent yield of $As[N(CH_3)C_6H_5.HCl]_3$ as compared to the 33.56 per cent yield with aniline, while under similar conditions dimethylaniline did not react with arsenous chloride.

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* Scientific Section, A. PH. A., Madison meeting, 1933.

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In addition to these arsenic compounds there is always a large amount of the ammonium halide formed in the course of the reaction and it is difficult, sometimes impossible, to separate the arsenic compounds.

Several types of compounds have definitely been isolated in the various reactions studied. Compounds of the type $XAs(NHR.HX)_2$ and $As(NHR.HX)_3$ are high melting solids, soluble in water, usually with decomposition, and insoluble in organic solvents. They resemble the corresponding ammonium halides in properties, and are best regarded as arsenic substituted ammonium halides. Thus the piperidine compound, $As(NC_5H_{10}.HCl)_3$, which is only slightly decomposed by cold water, precipitates silver chloride and lead chloride with silver nitrate and lead acetate solutions, forming $As(NC_5H_{10}.HCOOCH_3)_3$ and $As(NC_5H_{10}.HNO_3)_3$.

Compounds of the type X_2AsNHR are high-boiling liquids or low melting solids, obtained by distillation of the solvent after removal of the precipitated ammonium halide and the insoluble arsenic compounds. They fume in the air and are decomposed violently by water. Leonard (4) obtained only a 66 per cent yield of $As(NC_5H_{10}.HCl)_3$ using arsenous chloride and piperidine in *n*-heptane solution. This low yield was explained by the solubility of this compound in heptane, which is incompatible with the hydrochloride formula he proposed for the compound. He found, however, that ether precipitated the compound from heptane solution. In repeating Leonard's work, the author determined the solubility of $As(NC_5H_{10}.HCl)_3$ in heptane and found it to be 4×10^{-6} Gm. per cc. at 25°. The low yield obtained by Leonard is due to the formation of other heptane-soluble compounds of the type X_2AsNHR. Unless the ether is anhydrous these compounds are decomposed by the water present into arsenous oxide and piperidine hydrochloride.

NOMENCLATURE OF THE ARSENIC COMPOUNDS.

The name "arsenamide" is suggested for compounds containing the As-N linkage. Thus the following compounds, prepared by the author, are named: $C_2H_5(I)As\text{-}NHC_6H_5$, aniline-ethyliodoarsenamide; $Cl_2AsN(C_2H_5)_2$, diethylamine-dichlorarsenamide; $As(NC_5H_{10}.HCl)_3$, piperidine-arsentriamide trihydrochloride; and $ClAs(NH.CH_2.CH_2NH_2.HCl)_2$, ethylenediamine-chlorarsendiamide dihydrochloride.

EXPERIMENTAL.

The arsenous halides and amines were commercial products, purified by distillation. The substituted arsenous halides were prepared by the author. In the majority of the reactions studied anhydrous *n*-heptane was used as the solvent. This was prepared from Diggers Pine oil by the method of Kremers (11). Where other solvents were used, they were rendered completely anhydrous. The heptane solution of the amine or arsenous halide was placed in a tall form beaker and surrounded with an ice-bath. The tall form beaker was found most convenient for removal of the precipitate formed in the course of the reaction. The beaker was equipped with a cork, mechanical stirrer and dropping funnel. In some cases nitrogen gas was passed into the vessel during the course of the reaction, but this was usually found to be unnecessary. The *n*-heptane solution of the arsenous halide or amine was then added dropwise and the mixture stirred during the addition and for one hour longer to ensure the completion of the reaction. A heavy white precipitate formed immediately on addition of the solution. At the completion of the reaction the mixture was filtered, using suction. Nitrogen gas was used to protect the product from oxidation. The filter was further protected from moisture by placing P_2O_5 tubes in the

suction and nitrogen lines. The precipitate was washed several times with the pure solvent, transferred to a vacuum desiccator, and the air removed by flushing several times with nitrogen gas, and finally dried for several days at 20-mm. pressure. This precipitate consisted of the hydrohalide of the amine used, mixed with any insoluble arsenic compounds. Since these compounds are insoluble in organic solvents, and in most cases are decomposed by water or alcohol, their separation from the amine hydrohalide is extremely difficult. In the case of the piperidine compound it can be purified by fractional crystallization from alcohol. In several other cases separation can be effected by vacuum sublimation, as described by Schmidt for purifying the aniline compound. In most cases, however, no means of separation was found. In these cases the arsenic content was determined by analysis and computed to percentage of arsenous halide converted into arsenamide hydrohalides.

The filtrate from the original reaction contains the compounds of the type X_2AsNHR. The solvent was removed by distilling in an atmosphere of nitrogen at reduced pressure, and the arsenic compounds fractionated at 1–2-mm. pressure. These were collected in special receiving bottles, filled with nitrogen gas, and analyzed in thin-walled glass bulbs which could be crushed beneath the liquid used for analysis. In spite of these precautions it was difficult to obtain accurate analyses of these extremely unstable liquids.

REACTIONS STUDIED.

(1) Arsenous chloride and aniline. A *n*-heptane solution of aniline added to a *n*-heptane solution of arsenous chloride gave an 84.74 per cent yield of aniline-arsentriamide trihydrochloride, $As(NH.C_6H_5.HCl)_3$. It is a yellow solid, decomposed by water, insoluble in organic solvents.

Calculated for $As(NH.C_6H_5.HCl)_3$: arsenic 16.28 per cent. Found: arsenic 16.36 per cent. This compound is identical with that prepared by Schmidt (5). When the order of mixing was reversed the precipitate consisted largely of aniline hydrochloride. Arsenic analysis on the precipitate showed that there were present 33.56 per cent of the original arsenous halide used, but no means could be found of separating any arsenic compounds from the aniline hydrochloride. The filtrate, after removal of the heptane, yielded aniline-dichlorarsenamide, $Cl_2AsNHC_6H_5$, a yellow crystalline solid, m. p. 89°, decomposed violently by water.

Calculated for $Cl_2AsNHC_6H_5$: arsenic 31.50, chlorine 29.83. Found: arsenic 31.88, chlorine 29.92.

(2) Arsenous chloride and piperidine. A *n*-heptane solution of arsenous chloride added to a *n*-heptane solution of piperidine gave a 20.95 per cent yield of piperidine-arsentriamide trihydrochloride, $As(NC_5H_{10}.HCl)_3$. The compound was purified by fractional crystallization from absolute alcohol. It crystallized in long needles, m. p. 240–242°, and was decomposed by hot water and boiling alcohol. Calculated for $As(NC_5H_{10}.HCl)_3$: chlorine 24.39. Found: chlorine, 23.44. This compound is identical with that prepared by Leonard (4). The filtrate gave a yellow oil, b. p. 98°/1 mm. It fumed in the air and accurate analyses could not be made. It is probably piperidine-dichlorarsenamide, $Cl_2AsNC_5H_{10}$. The piperidine-arsentriamide trihydrochloride gave piperidine-arsentriamide trinitrate with silver nitrate in theoretical amounts, m. p. 144°.

Calculated for $As(NC_5H_{10}.HNO_3)_3$: arsenic 14.52. Found: 14.89. With lead acetate, piperidine-arsentriamide triacetate, $As(NC_5H_{10}.CH_3COOH)_3$, was obtained, m. p. 304°.

(3) Arsenous chloride and diethylamine. A *n*-heptane solution of arsenous chloride added to a *n*-heptane solution of diethylamine gave a precipitate consisting largely of diethylamine hydrochloride. Arsenic analysis on the precipitate showed that there was present 24.30 per cent of the original arsenous halide used. No arsenic compounds could be separated from the diethylamine hydrochloride. The filtrate gave diethylamine-dichlorarsenamide, $Cl_2AsN(C_2H_5)_2$, a yellow liquid, b. p. 107°/38 mm., fuming in the air, decomposed violently by water.

Calculated for $Cl_2AsN(C_2H_5)_2$: chlorine 32.58. Found: 32.35, 32.16.

(4) Arsenous chloride and ethylenediamine. A *n*-heptane solution of arsenous chloride added to a *n*-heptane solution of ethylenediamine gave a white precipitate. Ethylenediamine-chlorarsendiamide dihydrochloride, $ClAs(NH.CH_2CH_2NH_2.HCl)_2$ was obtained by extracting with boiling anhydrous acetone. It was a white solid, charring above 225° without melting.

Calculated for $ClAs(NHCH_2CH_2NH_2HCl)_2$: arsenic 24.86, chlorine 34.99. Found: arsenic 24.20, chlorine 34.09. The heptane filtrate was not examined.

(5) Arsenous chloride and methylaniline. A *n*-heptane solution of arsenous chloride added to a *n*-heptane solution of methylaniline gave a precipitate consisting largely of methylaniline hydrochloride. Arsenic analysis on the precipitate showed that there was present 14.32 per cent of the original arsenous chloride used. No arsenic compounds could be separated from the methylaniline hydrochloride. The filtrate gave methylaniline-dichlorarsenamide, $Cl_2AsN(CH_3)C_6H_5$, b. p. 116°/3 mm., fuming in the air and decomposed by water.

Calculated for $Cl_2AsN(CH_3)C_6H_5$: chlorine 28.18. Found: chlorine 28.29.

(6) Arsenous chloride and benzylamine. A *n*-heptane solution of arsenous chloride added to a *n*-heptane solution of benzylamine gave a white precipitate from which benzylamine-arsentriamide trihydrochloride was separated by sublimation at 170–200° and 2-mm. pressure. It was a white solid, m. p. 246° (decomposition), decomposed by water and alcohol.

Calculated for $As(NH.CH_2C_6H_5.HCl)_3$: arsenic 14.91, chlorine 21.19, nitrogen, 8.36. Found: arsenic 14.84, 14.87; chlorine 21.05, 21.44; nitrogen 8.38, 8.18. The benzylamine compounds were among the first studied and the heptane filtrates were not examined for possible arsenic compounds.

(7) Arsenous chloride and dibenzylamine. Dibenzylamine-arsentriamide trihydrochloride, $As[N(CH_2C_6H_5)_2.HCl]_3$, was prepared in a similar manner from dibenzylamine and arsenous chloride, and purified by vacuum sublimation. It is a white solid, m. p. 252–254° (decomposition) and decomposed by water and alcohol.

Calculated for $As[N(CH_2C_6H_5)_2.HCl]_3$: arsenic 9.69, chlorine 13.78, nitrogen 5.43. Found: arsenic 8.23, chlorine 13.56, nitrogen 5.30.

(8) Arsenous chloride and tribenzylamine. Just as alkyl halides may be added to tertiary amines to form quaternary ammonium salts, so arsenous chloride adds to tertiary amines to form arsenamide chlorides. Tribenzylamine-arsentriamide trichloride, $As[N(CH_2C_6H_5)_3Cl]_3$, was prepared in a similar manner to the other two benzylamine compounds and was purified by sublimation at 130–140° and 1-mm. pressure. It is a white solid, m. p. 209–211° with decomposition.

Calculated for $As[N(CH_2C_6H_5)_3Cl]_3$: arsenic 7.19, chlorine, 10.22, nitrogen 4.03. Found: arsenic 7.47, chlorine 9.49, nitrogen 3.67.

(9) Ethyldichlorarsine and piperidine. A *n*-heptane solution of ethyldichlorarsine added to a *n*-heptane solution of piperidine gave a white precipitate consisting partially of piperidine hydrochloride. By vacuum sublimation at 95–105° and 1-mm. pressure, piperidine-ethylarsendiamide dihydrochloride was separated from the piperidine hydrochloride. It is a white solid, m. p. 196°, decomposed by water.

Calculated for $C_2H_5As(NC_5H_{10}.HCl)_2$: arsenic 21.7, chlorine 21.0. Found: arsenic 21.22, chlorine 20.5. The heptane filtrate gave piperidine-ethyldichlorarsenamide, $C_2H_5As(Cl)NC_5H_{10}$. It is a yellow liquid, b. p. 108°/8 mm. It reacts violently with water to give ethylarsenoxide and piperidine hydrochloride.

Calculated for $C_2H_5As(Cl)NC_5H_{10}$: arsenic 33.52, chlorine 15.87. Found: arsenic 33.30, chlorine 15.88.

(10) Ethyldiiodoarsine and aniline. A *n*-heptane solution of ethyldiiodoarsine added to a *n*-heptane solution of aniline gave a white precipitate consisting largely of aniline hydroiodide. Arsenic analysis on the precipitate showed that there were present 12.92 per cent of the original ethyldiiodoarsine used. No arsenic compounds could be separated from the aniline hydroiodide. The filtrate gave aniline-ethyliodoarsenamide, $C_2H_5(I)AsNHC_6H_5$, as a light yellow oil, b. p. 110°/10 mm. which crystallized to a yellow solid on standing. It fumed in the air and reacted violently with water. Calculated for $C_2H_5(I)AsNH.C_6H_5$: arsenic 23.93, iodine 39.30. Found: arsenic 23.84, 23.69; iodine 39.62.

(11) Dimethylchlorarsine and piperidine. A *n*-heptane solution of dimethylchlorarsine added to a *n*-heptane solution of piperidine gave a white precipitate consisting almost entirely of piperidine hydrochloride. The heptane filtrate gave piperidine-dimethylarsenamide, $(CH_3)_2AsNC_5H_{10}$. It is a colorless liquid, b. p. 75°/8 mms. This compound is considerably more stable toward moisture than the corresponding halogen arsenamides.

Calculated for $(CH_3)_2AsNC_5H_{10}$: arsenic 39.64. Found: arsenic 39.44, 39.50.

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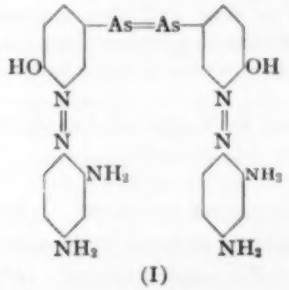
THE PREPARATION AND PROPERTIES OF 3,3′BIS(AZOMETA-PHENYLENEDIAMINE)-4,4′-DIHYDROXYARSENOBENZENE AND 3,3′-BIS-(AZO-2,6-DIAMINOPYRIDINE)-4,4′-DIHYDROXYARSENOBENZENE.*

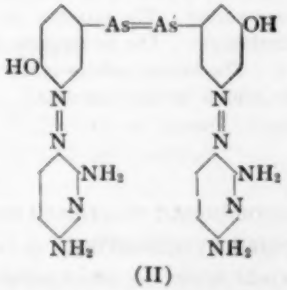
BY A. E. JURIST AND W. G. CHRISTIANSEN.[1]

It is well known that certain azo dyes penetrate tissue very readily, thereby being disseminated widely throughout the body. Further, some azo dyes, such as trypan blue and trypan red, are absorbed by trypanosomes and have a definite trypanocidal action. Consequently it was decided to prepare some azo dyes from arsphenamine base by diazotizing the latter and coupling with diamines. A number of arsono and arseno azo compounds have been described by Andreyev (1), Karrer (2), Barrowcliff, Pyman and Remfry (3), Benda (4), Jacobs and Heidelberger (5), and Ehrlich and Bertheim (6). Also some patents have been issued covering such compounds. However, none of them are of the type which we prepared by diazotizing arsphenamine and coupling with metaphenylenediamine and with 2,6-diaminopyridine.

The two substances prepared in this investigation were 3,3′-bis(azometaphenylenediamine)-4,4′-dihydroxyarsenobenzene (I) and 3,3′-bis(azo-2,6-diaminopyridine)4,4′-dihydroxyarsenobenzene (II).



(I)



(II)

When aqueous sodium hydroxide solutions of these compounds were injected intravenously into albino rats, the anticipated tissue staining characteristics resulted. Thus, within a short time after injection the conjunctiva, ears and abdominal cavities of the animals were stained. However, both of these compounds

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were very toxic when compared to other arsphenamines. The sodium salt of 3,3′-bis(azo-2,6-diaminopyridine)-4,4′-dihydroxyarsenobenzene was found to be bacteriostatic to both *B. Typhoid* and *B. Staphylococcus* in concentrations of 1–20,000. Further, although the free base was only slightly soluble in water, a saturated aqueous solution was bacteriostatic to both *B. Typhoid* and *B. Staphylococcus*. However, both compounds appear to be too toxic for therapeutic use.

EXPERIMENTAL.

3,3′-Bis(Azometa-phenylenediamino)-4,4′-Dihydroxyarsenobenzene.—A solution of 8.8 Gm. of arsphenamine in 880 cc. of water was cooled in ice and 3.5 cc. of concentrated hydrochloric acid was added. This was then diazotized by adding 3.0 Gm. of sodium nitrite dissolved in 10 cc. of water. After stirring for $^1/_2$ hour, 4.3 Gm. of metaphenylenediamine dissolved in an excess of dilute hydrochloric acid was added. After stirring for one hour a slight excess of sodium bicarbonate was added. A finely divided red-brown precipitate formed which was separated by centrifuging. It was resuspended in water, collected on a Buchner funnel and washed with water.

Assay: As found, 28.11%; calculated for $C_{24}H_{22}O_2N_8As_2$, 24.83%.

The dark brown solid was soluble in concentrated aqueous hydrochloric acid and aqueous sodium hydroxide, giving a deeply colored solution. It was also slightly soluble in water, ethyl alcohol, methyl alcohol, acetone and ether. 0.2 Gm. dissolved completely in 20 cc. of water and 1.5 cc. of normal sodium hydroxide.

Intravenous injections were made in rats using a solution of 0.5 Gm. of compound in 5 cc. of normal sodium hydroxide and 45 cc. of water. A dose of 100 mg./Kg. was lethal and stained the conjunctiva, ears and abdominal cavity a pale yellow color. Also a blue-greenish color of the skin of the back and shoulders was noted immediately after injection which disappeared in 30 minutes. Owing to the toxicity of this compound it was not further tested.

3,3′-Bis(Azo-2,6-diaminopyridine)-4,4′-Dihydroxyarsenobenzene.—A solution of 5 Gm. of arsphenamine base in 250 cc. of water and 9 cc. of concentrated hydrochloric acid was cooled to 0° C. by the addition of ice and diazotized by adding 3.0 Gm. of sodium nitrite dissolved in 20 cc. of water. Then 3.0 Gm. of 2,6-diaminopyridine dissolved in 12 cc. of hydrochloric acid and 60 cc. of water was added. The mixture was stirred for $^3/_4$ of an hour and then neutralized with sodium bicarbonate. The precipitate so obtained was collected on a Buchner funnel and washed with water. The brown solid was insoluble in water, slightly soluble in dilute hydrochloric acid and readily soluble in aqueous alkali.

Assay: Found, As 24.79%, N 22.94%; calculated for $C_{22}H_{20}O_2N_{10}As_2$, As 24.74%, N 23.10%.

This compound was tested for toxicity by intravenous injection. The solution was prepared by dissolving 1.0 Gm. in 4 cc. of normal sodium hydroxide solution and sufficient water to make solutions of 0.5% to 3.0% concentration. The results of these tests are given in the following table.

These results show that this compound is extremely toxic when injected intravenously since no rats survived even at doses of 5 mg./Kg. This compares unfavorably with a tolerated dose of 200 mg./Kg. for arsphenamine.

The oral toxicity was found to be between 24 and 52 mg./Kg. of body weight.

This compound was also subjected to germicidal and bacteriostatic tests on *B. Typhoid* and *B. Staphylococcus*. The results of these tests are given in Table II.

TABLE I.

Dosage, Mg./Kg.	Concentration of Solution Used, Per Cent.	Number of Rats Injected.	Number of Rats Died.	Survival Time.
5	0.5	2	2	4 to 21 hours
10	0.5	2	2	½ to 3 hours
10	1.0	2	2	2 to 6 hours
20	1.0	3	3	2 to 6 hours
40	1.0	3	3	2 to 5 hours
50	2.0	1	1	14 minutes
100	2.0	1	1	6 minutes
200	3.0	1	1	2 minutes
277	3.0	1	1	30 seconds

TABLE II.

Germicidal Tests. Concentration.	Result.	Bacteriostatic Tests. Concentration.	Result.
Alkaline solution 1–100	Inactive	Alkaline solution 1– 1,000	Active
Alkaline solution 1–500	Inactive	Alkaline solution 1– 5,000	Active
Alkaline solution 1–1000	Inactive	Alkaline solution 1–10,000	Active
Saturated aqueous solution	Inactive	Alkaline solution 1–20,000	Active
		Alkaline solution 1–50,000	Inactive
		Saturated aqueous solution	Active

NOTE: These results apply equally to *B. Typhoid* and *B. Staphylococcus*.

SUMMARY.

1. Two azo derivatives of arsphenamine were prepared by coupling diazotized arsphenamine with metaphenylenediamine and 2,6-diaminopyridine, respectively.

2. These two substances were found to penetrate the tissue of test animals very rapidly, but were too toxic for therapeutic purposes.

3. One of these compounds, 3,3′-bis(azo-2,6-diaminopyridine)-4,4′-dihydroxy-arsenobenzene was found to be bacteriostatic but not germicidal to *B. Typhoid* and *B. Staphylococcus*.

The biological tests on compounds reported herein were made in the Biological Research Laboratories of E. R. Squibb and Sons and we gratefully acknowledge their assistance.

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(1) Andreyev, *J. Russ. Phys.-Chem. Soc.*, 45, 1980 (1913).
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Harvard University has created a new Doctor of Philosophy degree in the "History of Science and Learning." Dr. Conant in explanation of this degree stated that "the history of science, the history of ideas, the history of scholarship and the history of universities should now be occupying the attention of many instead of a few."

Winners of the degree will be required to have a knowledge of six major fields and to master the technique of historical and scientific investigation. Harvard's Graduate School of Arts and Sciences now offers more than a score of courses in various phases of the history of knowledge.

THE EFFECT OF ALTITUDE ON THE ACTION OF DRUGS. I. STRYCHNINE.*

BY A. W. MOORE AND JUSTUS C. WARD.[1]

Medical and veterinary practice has long known that differences in altitude have made necessary the modification of doses in the use of many potent drugs. The purpose of these investigations is to make quantitative studies of the variation in lethal doses as well as of the speed of action of the drugs involved when all variables, except altitude, are held as constant as possible. Strychnine, as the sulphate, is the drug studied in the present communication.

Two distinct experiments were conducted. In the first series tame rats were used, in the second series, Columbian ground squirrels. One hundred tame rats

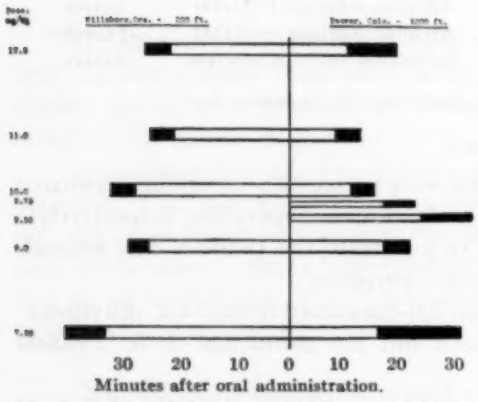

Fig. 1.—Reaction time of rats to strychnine; periods until symptoms, duration of convulsions, and death.

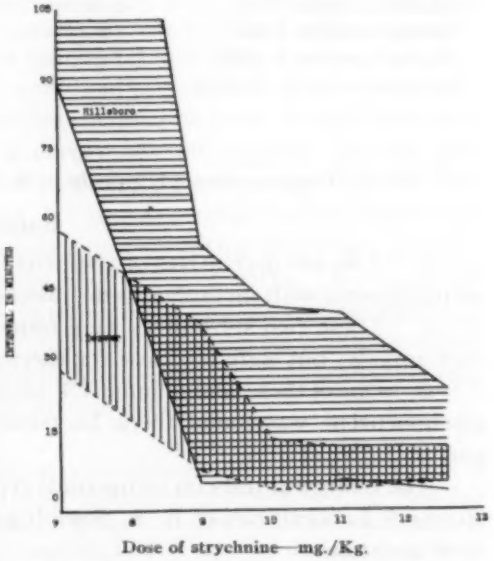

Fig. 2.—Interval between administration and tetany or death; zone indicates duration of convulsions.

of uniform size, 8 to 10 weeks old, were purchased from a Denver, Colo., breeder who raises large and healthy stock. Half of these were forwarded to Hillsboro, Ore., and the others retained at Denver. Feed for both groups was purchased at Denver and divided so the ration was identical at both stations. The animals were held for 3 months to insure complete acclimatization.

Just a few days before the tests were to be conducted, the poison solution to be used was prepared at Denver and also divided. Half of it was carefully sealed and sent to Hillsboro, and the other half retained at Denver. The same technique of administering the poison orally was employed at both elevations.

On the day of the tests, the room temperature, barometric pressure, relative humidity, and character of the weather were all recorded. There was fortunately

* Scientific Section, A. PH. A., Madison meeting, 1933.

[1] Bureau of Biological Survey, Hillsboro, Ore., and Denver, Colo.

a gratifying check of conditions, so the difference in barometric pressure due to the variation in altitude was the principal factor to explain the observed changes in rate and degree of strychnine action.

Table I gives the climatological comparisons at the two stations during the period of the tests.

The poison used in this test was strychnine, as sulphate, in a concentration of $2^1/_2$ mg./cc. in distilled water.

Table II gives the detailed experimental results of the altitude experiments with tame rats. Fig. 1 shows the same data graphically.

In Table III the correlations were made on the basis of the probable errors (PE) of the averages and are so listed. It appears from Tables II and III that the LD_{100} per cent (lethal dose for 100 per cent of the animals tested) was 12.50 mg./Kg. at Hillsboro and 10.00 mg./Kg. at Denver. Also 10/10 animals at Hillsboro died in 25 minutes after 4.1 minutes of intermittent tetany, while at Denver the figures were 15.0 and 4.0 minutes, respectively.

TABLE I.

	Hillsboro, Oregon.	Denver, Colorado.
Altitude	200 feet	5280 feet
Barometric pressure	757, 765, 768, 760 mm.	625 mm.
Temperature	20° C., 21.1° C.	22.2° C.
Relative humidity	44%, 67%, 56%, 87%	12%

TABLE II.

Dose Mg./Kg.	Hillsboro, Oregon. Ratio.	*T/S Minutes.	+T/T Minutes.	ϕT/D Minutes.	Denver, Colorado. Ratio.	T/S Minutes.	T/T Minutes.	T/D Minutes.
12.50	10/10	21.1	4.1	25.2	6/6	10.2	8.8	19.0
11.00	6/10	20.7	4.0	24.7	6/6	8.3	4.0	12.3
10.00	6/8	27.2	4.1	31.3	6/6	11.0	4.0	15.0
9.75	...	..	...	..	3/6	15.3	6.7	22.0
9.50	...	..	...	..	4/6	23.0	9.0	32.0
9.00	5/10	16.4	3.4	28.6	3/6	25.2	4.3	20.7
7.50	1/10	33.0	7.0	40.0	3/6	15.3	14.7	30.0

* Time to onset of spasm. + Period of intermittent tetany. ϕ Time to death.

TABLE III.—STATISTICAL CORRELATIONS.

Dose Mg./Kg.	T/T. Hillsboro.	T/T. Denver.	T/D. Hillsboro.	T/D. Denver.
12.50	4.1 ± 2.49	5.6 ± 2.30	25.2 ± 11.18	12.8 ± 2.58
11.00	4.0 ± 1.41	4.0 ± 3.10	24.7 ± 9.15	12.3 ± 5.25
10.00	4.1 ± 2.39	4.0 ± 1.69	31.3 ± 5.08	15.0 ± 5.08
9.00	3.4 ± 1.42	4.3 ± 1.89	28.6 ± 5.15	20.7 ± 1.50
7.50	.....	14.7 ± 6.40	.....	30.0 ± 8.45

In Table IV an attempt was made to evaluate the survivals in relation to the effectiveness of the dose. The averages for each dose were divided by the unit percentage of the animals that died in the series represented by the average involved. For example, at Hillsboro 100 per cent of the animals given 12.50 mg./Kg. died in 25.2 minutes; accordingly 25.2/1.00 = 25.2. However, at 9.00 mg./Kg. only 50 per cent of the animals died in 28.6 minutes, and 28.6/0.5 = 57.2. This then becomes the new average, when the survivals have been evaluated in this way. Fig. 2 shows graphically how well this system of correlation actually causes the data obtained to approach the ideal curves. In the case of the "time to death" T/D lines, at Hillsboro the curve approaches a straight line at 12.50 and again at 7.50 mg./Kg., indicating all animals would die at 12.50 or above and all animals would live below 7.50. Between those figures the curve approaches the ideal configuration. At Denver, however, the experiment is not sufficiently complete at the lower doses to draw such definite conclusions. It does, however, show that above 10.00 mg./Kg. a

straight line is approached, and that below 7.50 the tendency would be a sharp break upward, indicating a high percentage of survivals.

To determine whether the averages included in the above tables were significant, the PE of the differences between them were computed. Table V gives these data for the doses 9.00–12.50 mg./Kg. These figures were obtained from the averages of the animals that actually died, and consequently do not show the range that would have been indicated had the evaluated survivals been included. The table shows no significance for any of the figures on the period of intermittent tetany (T/T), but it does show PE of 2.9–5.56 for the T/D figures. From tables of probabilities (1) these figures mean that the chances of recurrence range from 1 in 20 to 1 in 5000. These ranges are not highly significant, but do indicate a definite effect from altitude differences on strychnine susceptibility.

Similar studies on Columbian ground squirrels were undertaken with much less detail in the field by the senior author.

The original plan was to conduct dosage trials so as to have the plant development stage similar at all elevations. This was done at the first two points studied,

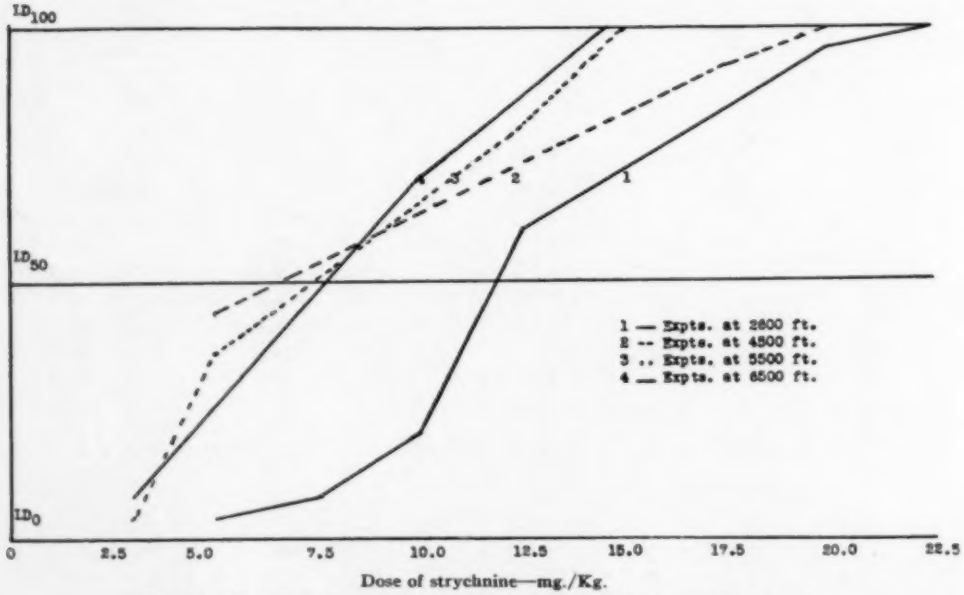

Fig. 3.—Toxicity of strychnine orally to Columbian ground squirrels.

but the third and fourth locations were reached when plant growth was approximately a week younger than that at the first two.

Elevations used were obtained from Geological Survey maps, and are accurate to 100 feet.

Table VI shows a gradual decline in the LD_{100} per cent as elevation increases. Fig. 3 gives the data graphically. The animals used were obtained from areas where no trapping and poisoning had previously been done.

Table VI reveals two points of major interest:

(1) The LD_{100} per cent varies inversely with the altitude. Plotting LD_{100} per cent against altitude an equation can be developed: $y = 14{,}300 - 520x$ (where y is the LD and x the altitude). This equation suggests a decrease in LD_{100} of about 2.0 mg./Kg. for each 1000 ft. increase in elevation, when Columbian ground squirrels are poisoned with strychnine. The LD_{50} per cent doses show a similar relationship.

(2) The T/D varies directly with the altitude. This conclusion is reached, however, from correlations in which average times for entire series were taken, and exactly comparable doses are not available.

TABLE IV.—AVERAGES WITH SURVIVAL EVALUATIONS INCLUDED.

Dose. Mg./Kg.	T/T. Hillsboro.	T/T. Denver.	T/D. Hillsboro.	T/D. Denver.
12.50	4.1	5.6	25.2	12.8
11.00	6.7	4.0	41.2	12.3
10.00	5.5	4.0	42.6	15.6
9.00	6.8	8.6	57.2	41.4
7.50	70.0	29.4	400.0	60.0

TABLE V.—SIGNIFICANCE CORRELATIONS.

Dose.	T/T. Hillsboro.	T/T. Denver.	T/D. Hillsboro.	T/D. Denver.	Probable Errors of the Differences T/D.	Probability of Recurrence.
12.50 mg./Kg.						
Average time	4.1	5.6	25.2	12.8	..	..
PE_{mean}	0.79	1.03	3.54	1.15	3.33	1:40
11.00 mg./Kg.						
Average time	4.0	4.0	24.7	12.3	..	..
PE_{mean}	0.57	1.27	3.72	2.14	2.88	1:20
10.00 mg./Kg.						
Average time	4.1	4.0	31.3	15.0	..	..
PE_{mean}	0.97	0.69	2.06	2.08	5.56	1:5000
9.00 mg./Kg.						
Average time	3.4	4.3	28.6	20.7	..	..
PE_{mean}	0.63	1.09	2.30	0.87	3.21	1:35

TABLE VI.—EXPERIMENTAL RESULTS—STRYCHNINE ALTITUDE STUDIES, COLUMBIAN GROUND SQUIRRELS—ORAL ADMINISTRATION.

Altitude.	Doses. Mg./Kg.	Ratio.	Average. T/T Minutes.	Average. T/D Minutes.
2600 ft.	5.0	1/26		
	7.5	1/12		
	10.0	2/10		
	12.5	6/10		
	20.0	24/25		
	22.5	25/25	*7.0*	*21.0*
4500 ft.	5.0	11/25		
	17.5	23/25		
	20.0	25/25	*11.5*	*35.0*
5500 ft.	3.0	1/25		
	5.0	9/25		
	12.5	20/25		
	15.0	25/25	*8.5*	*34.5*
6500 ft.	3.0	2/25		
	10.0	7/10		
	12.5	22/25		
	15.0	25/25	*17.8*	*44.4*

CONCLUSIONS.

(1) A change in elevation of 5000 feet caused a 20 per cent reduction in LD_{100} per cent and a 40 per cent decrease in the T/D (time to death), following oral administration of strychnine as the sulphate to tame rats.

(2) Statistical analysis shows the effects observed are not highly significant, ranging from 1–20 to 1–5000.

(3) Inclusion of survivals, by a percentage system of evaluation, causes the curves to approach the ideal.

(4) Successive increases of elevation of 1000 feet produced a definite and fairly constant reduction in LD_{100} per cent of strychnine administered orally to Columbian ground squirrels.

(5) Ground squirrels appeared to be more susceptible than rats to changes in elevation.

ACKNOWLEDGMENT.

Much credit is due A. D. Stephenson, a junior in grazing studies at the University of Montana, for without his assistance, which he gave whole-heartedly in the form of many 16-hour days, it would have been impossible to complete the studies on the Columbian ground squirrels as outlined. Our appreciation is also due Dr. James C. Munch for his courteous assistance in checking the data presented, with particular reference to the statistical interpretations.

REFERENCE.

(1) Munch, James C., "Application of Statistical Methods to Pharmaceutical Research. I. Measures of Accuracy," JOUR. A. PH. A., 20, 126 (1931).

PORTLAND'S A. PH. A. CONVENTION COMMITTEE.

Members of committee in charge of arrangements for convention in Portland scheduled for August 5–10, 1935. **Seated:** Left, A. O. Mickelsen, *Local Secretary;* Mrs. Ralph A. Watson, *in Charge of Women's Activities,* and L. G. Haack, *General Chairman.* **Standing:** Left to Right: E. A. Stipe, *Transportation;* Earl Gunther, *Scientific Display;* F. C. Felter, *Publicity;* Peyton Hawes, *Entertainment;* Fred Geue, *Treasurer;* Frank Nau, *Vice-Chairman;* and Frederick Grill, *Secretary, Local Committee.* Dean A. O. Ziefle, *Chairman, Reception Committee,* not present when picture was taken.

THE PRESERVATION OF HALIBUT LIVER OIL WITH HYDROQUINONE.*,[1]

BY W. S. JONES AND W. G. CHRISTIANSEN.

It has been shown (1), (2) that the absorption of oxygen by cod liver oil is greatly retarded by the presence of an antioxidant, thus preventing loss of Vitamin A and development of mal-flavors in especially prepared oils. H. N. Brocklesby and O. F. Denstedt (3) have recently shown that the rate of absorption of oxygen by pilchard oil can also be decreased greatly by the addition of an antioxidant such as hydroquinone or pyrogallol.

Halibut Liver Oil is not only a very potent and highly concentrated source of Vitamin A, but also an oil which requires special refining in order to free it from natural objectionable odor and taste; hence an oil in which such protection should be of utmost importance. Therefore a study was made to determine the degree of protection afforded by an antioxidant such as hydroquinone in preventing vitamin and other deterioration. The present work shows that when halibut liver oil is exposed to both air and oxygen, the absorption of oxygen[2] and the loss of Vitamin A[3] is greatly retarded by the presence of hydroquinone.

EXPERIMENTAL.

A. Type of Oils Studied.—Two samples (A and B) of refined halibut liver oil differing slightly in Vitamin A potency were used; into a portion of each of these oils was incorporated 0.03% hydroquinone.

B. Preparation of Samples.—Four 25-Gm. portions of each of the four oils were weighed into 100-cc. tared beakers. Two weighed portions of each group were allowed to stand exposed to the air in the laboratory. (A paper covering was placed over samples to protect them against dust and yet not to exclude free access of air.) The remaining two weighed portions of each group were placed in a ten-inch vacuum desiccator. By means of inlet and outlet tubes in the cover of the desiccator, the air in the desiccator was swept out with oxygen. The inlet and outlet tubes were then closed off by means of pinch clamps.

C. Testing of Samples.—One sample of each pair was tested weekly by the Vitamin A color test; the second of each pair was weighed weekly. In case of samples exposed to oxygen the space in the desiccator was reflooded with oxygen and sealed from the air after each weekly observation.

D. Vitamin A Color Unit.—As a relative index of the Vitamin A potency of the oils, our laboratories have adopted a color standard (developed by the Biological Laboratories of E. R. Squibb and Sons) prepared as follows:

Five-cc. portions of 0.5 *M*-$CuSO_4.5H_2O$ (made up in 1% HCl) are measured out; 0.1-, 0.3-, 0.4-, 0.5- and 0.6-cc. portions of 0.5 *M*-$CoCl_2$ in 1% HCl are added, respectively, to different portions of copper sulphate solution. The mixtures are then diluted with 1% HCl to exactly 10 cc. and exactly 2 cc. of each solution is transferred to a 1-cm. bore test-tube and sealed. The cobaltous chloride imparts a red tint to the blue copper sulphate solution and the gradation in red obtained by the addition of increasing amounts of the cobalt solution makes it possible to match accurately the shades of blue produced by different oils. One cm. of thickness of this solution approximates six Lovibond blue units.

E. Technique of the Antimony Trichloride Vitamin A Color Test.—One-tenth gram of oil is weighed out and dissolved in chloroform to make a volume of 50 cc. A measured volume of the chloroform solution is diluted with more chloroform, so that the addition of 1.8 cc. of a saturated

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* Section on Practical Pharmacy and Dispensing, Madison meeting, 1933.

[1] Research Department of the Chemical and Pharmaceutical Laboratories, E. R. Squibb and Sons, Brooklyn, N. Y.

[2] Determined by increase in weight of the oil.

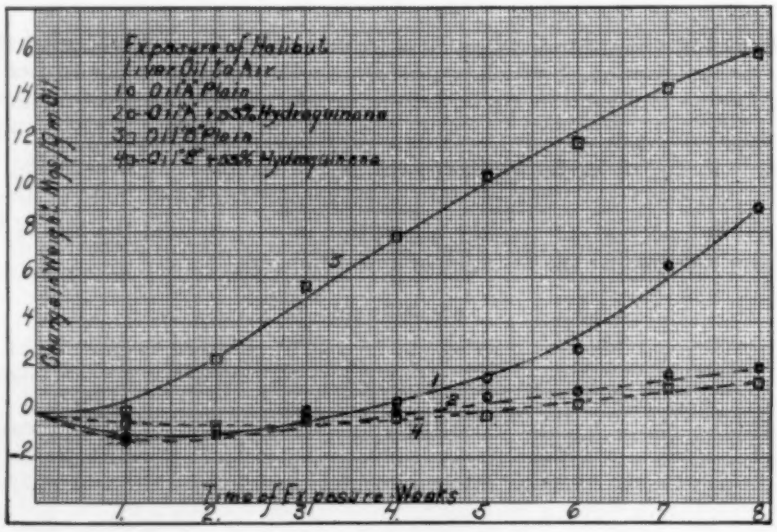
[3] Determined by color test and confirmed by biological assay.

chloroform solution of antimony trichloride to 0.2 cc. of the chloroform solution of oil in a 1-cm. bore test-tube produces a blue color which matches one of the copper sulphate standards. The Vitamin A color units per Gm. of oil would then be

$$\frac{50 \times A}{\text{Wt. of oil} \times 0.2}$$

A is the dilution factor; *i. e.*, the degree to which the 50 cc. of $CHCl_3$ solution must be diluted in order to match the standard blue. Thus, if 5 cc. is diluted to 20 cc., A will be 4.

F.—The results of the successive color tests are recorded in Table I.



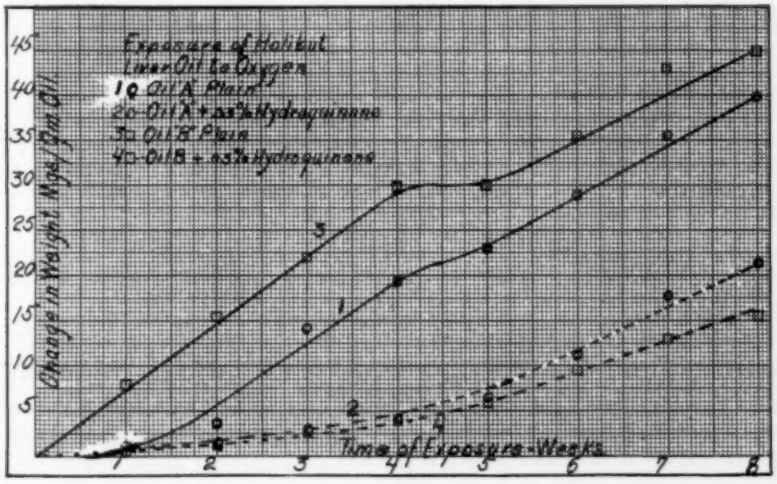
Graph 1.

TABLE I.

Initial Color Test.	Sample No.	Condition of Exposure.	Antioxidant.	Vitamin A Color Units per Gm. First Week.	Second Week.	Third Week.	Fourth Week.	Fifth Week.	Sixth Week.	Seventh Week.	Eighth Week.
	1	Air	None	10600	10900	10530	9000	9090	6000	Released for Bio. Assay	
Oil A	5	Air	Hydroquinone	10700	10800	10070	9250	10300	9500		
11,100 cu./Gm.	3	Oxygen	None	10500	7500	*	..	...	..		
	7	Oxygen	Hydroquinone	10700	10400	9000	7500	5450	*	..	..
	9	Air	None	7250	5200	3000	*	...	..	..	..
Oil B	13	Air	Hydroquinone	7270	7700	7500	7850	7500	7300	6550	6410
8700 cu./Gm.	11	Oxygen	None	3230	*	...	..	...	..	..	..
	15	Oxygen	Hydroquinone	8700	6820	6900	5680	5600	4500	2700	*

* At this point the color produced by the $SbCl_3$ has become so violet that it cannot be matched with the standards.

It was noted during the course of the work that as the Vitamin A was being destroyed (as indicated by the color test) the color of the oil gradually changed from a light amber to a bright yellow. Further the color produced in the antimony trichloride test differed from the copper sulphate blue (it became reddish purple), so that it could not be matched by any of our standards. The difference was slight in the beginning and became more noticeable as the experiment progressed. This change was very rapid and pronounced in samples without antioxidant and exposed to oxygen; the change becomes slower when an antioxidant is used and the exposure is less severe, *i. e.*, air instead of oxygen.



Graph 2.

These color tests show that exposure of halibut liver oil to oxygen as such or as air causes Vitamin A deterioration and that these losses are retarded greatly by the addition of hydroquinone.

G.—In order to confirm the results of the color tests, one pair of samples (Oil A without and with hydroquinone—Nos. 1 and 5 in Table I) were assayed biologically after they had been exposed to air for six weeks. The results are contained in Table II and show the pronounced protection afforded by Hydroquinone.

TABLE II.

	Vitamin A Potency in U. S. P. X Units.*
Original Oil	76,750
After 6 weeks' exposure to air without hydroquinone	41,500
Protected by addition of 0.03% hydroquinone and exposed to air for 6 weeks	61,250

* Not to be confused with new units (1934 Revised). To convert to 1934 Revised Units use factor 1.4.

H.—The change in weight of oils in mg./Gm. of oil, due to exposure to air and oxygen, are recorded in Table III and the data are plotted in curves on Graphs 1 and 2. Due to the fact that the increases in weight of oils exposed to pure oxygen were so much greater than those of the oils exposed to air the data of the two groups were plotted on separate plates. No explanation can be given at present for the sudden, temporary leveling of Curve 3, Graph 2.

It will be noted from Graphs 1 and 2 that

(*a*) Oils A and B without hydroquinone (Curves 1 and 3) differ in susceptibility to oxidation; this is particularly noticeable in the "air" experiment (Graph 1).

(*b*) Oils A and B with hydroquinone (Curves 2 and 4) do not differ appreciably in susceptibility to oxidation.

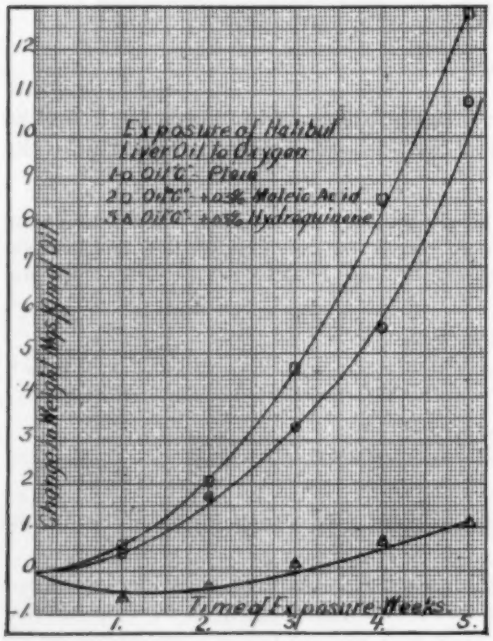
(*c*) An oil containing 0.03% hydroquinone is quite resistant to oxidation as compared with unpreserved oil.

TABLE III.

Sample No.	Exposed to	Antioxidant.	Change in Weight—(Mg. per Gm. of Oil). First Week.	Second Week.	Third Week.	Fourth Week.	Fifth Week.	Sixth Week.	Seventh Week.	Eighth Week.
						Oil A.				
2	Air	None	−1.1*	− 0.85	+ 0.02	+ 0.43	+ 1.5	+ 2.8	+ 6.5	+ 9.1
4	Oxygen	None	+1.2	+ 3.7	+14.2	+19.2	+23.1	+29.0	+35.5	+39.8
6	Air	0.03% hydroquinone	−1.2	− 1.0	− 0.3	− 0.05	+ 0.7	+ 0.9	+ 1.7	+ 2.0
8	Oxygen	0.03% hydroquinone	+0.5*	+ 1.5	+ 3.0	+ 4.3	+ 6.5	+11.1	+17.7	+21.4
						Oil B.				
10	Air	None	+0.1	+ 2.4	+ 5.6	+ 7.8	+10.5	+12.0	+14.4	+16.0
12	Oxygen	None	+8.0	+15.6	+21.8	+29.7	+29.9	+35.5	+40.6	+44.8
14	Air	0.03% hydroquinone	+0.5	− 0.6	− 0.3	− 0.3	− 0.2	+ 0.35	+ 1.1	+ 1.3
16	Oxygen	0.03% hydroquinone	+1.2	+ 1.6	+ 2.8	+ 4.1	+ 5.8	+ 8.5	+13.1	+16.5

* − Decrease in weight,
+ Increase in weight.

I.—According to Greenbank (U. S. Patent 1,898,363) maleic acid inhibits the oxidation of unsaturated fats, oils, fatty acids and substances which contain fatty material and tend to become rancid. In order to study the antioxidant effect, if any, of maleic acid in halibut liver oil, an experiment, similar to that described above for oils "A" and "B" was set up, in which samples of a halibut liver oil, containing, respectively, (*a*) no antioxidant, (*b*) 0.03% hydroquinone, and (*c*) 0.03% maleic acid, were exposed to pure oxygen for 5 weeks. As before, one series of samples was weighed weekly and a second series was tested colorimetrically for Vitamin "A" weekly. The oil containing maleic acid was no more resistant to oxidation than the plain halibut liver oil and, according to the color test, lost its Vitamin "A" potency at the same rate as the plain oil. The oil containing the hydroquinone showed the usual resistance to oxidation and loss of Vitamin "A." The change in weight in mg./Gm. of oil is recorded graphically in Graph 3.



Graph 3.

CONCLUSIONS.

1. Hydroquinone retards the absorption of oxygen by refined halibut liver oil from air and an atmosphere of pure oxygen.

2. Hydroquinone, as indicated by the Vitamin A color test retards the deterioration of Vitamin A of halibut liver oil upon exposure to air or pure oxygen.

3. Hydroquinone, as shown by the biological test retards the deterioration of Vitamin A of Halibut Liver Oil upon exposure to air.

4. Maleic acid does not act as an antioxidant in halibut liver oil.

Biological assays reported herein were made in the Biological Research Laboratories of E. R. Squibb and Sons and we gratefully acknowledge their assistance; also that of Mr. E. Beaman of Research Laboratories of E. R. Squibb and Sons who assisted in our experimental work.

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(1) Christiansen, *et al.*, JOUR. A. PH. A., 18, 771 (1929).
(2) Christiansen, Chappel, Briod, U. S. Patent 1,745,604.
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ACCURACY AND SPEED FACTORS IN HAND-FILLING CAPSULES.*

BY JOHN W. LEE.[1]

The primary purpose of this paper is to compare two of the usual methods ordinarily employed in hand-filling capsules. One of the first problems that confronts us in either the establishment of a tolerance limit or the comparison of methods in hand-filling capsules, is the method or manner in which the contents of an individual capsule is determined.

Some of the methods that have been used in determining the contents of an empty capsule are:

(1) Dissolving the contents of the capsule in a suitable solvent and subsequent evaporation of the solvent.[2]

(2) Assay of the ingredients by the Official Process.

(3) The emptying of the contents and weighing directly.[3]

(4) Using individual capsules of the same size as a counterpoise.[2]

(5) Weighing a number of filled capsules at the same time using an equal number of empty shells as a counterpoise, changing the empty shells for different ones after one or two operations.[3]

The first method has the disadvantage of requiring too long a time, and it is not always possible to find a suitable solvent, especially, when the capsule contains a mixture of powders.

The second method mentioned also requires too much time and is not practical enough for use by the practicing pharmacist.

The third method, consisting of emptying the contents of the capsule and weighing directly is better suited for general use, but here again too much time is consumed and in the case of adhesive powders it is almost impossible to remove all of the powder from the shell.

The fourth method, using the empty shell as a counterpoise, introduces the error caused by the variance in weight of the individual shells.

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* Section on Practical Pharmacy and Dispensing, A. PH. A., Washington meeting, 1934.

[1] Assistant Professor in Pharmaceutical Chemistry. The George Washington University School of Pharmacy. In collaboration with Prof. W. P. Briggs.

[2] Private communication.

[3] Mathews, Norris W., JOUR. A. PH. A., 22, 321 (1933).

The fifth method eliminates to some degree the variance of the empty shell, but the average weight of the filled capsules must be taken, therefore it is not a true measure of the individual contents.

Experiments were carried out in an effort to eliminate some of the errors as pointed out in the foregoing methods and to find a method accurate enough and practical enough to enable the practising pharmacist to assure himself that, in the great majority of cases, his work is within the reasonable limit of error.

A number of empty shells ranging from twenty to one hundred were taken at random from stock, and each batch was weighed carefully on an analytical balance. The average weight of the individual shells in each batch was determined and then the averages of these averages computed. This figure was used as the tare in all instances where this size of capsule was employed.

In private communications with some of the leading manufacturers of empty capsules the writer was informed that the weight of empty shells of the same lot rarely varied more than three per cent of the average weight of the empty shell. One manufacturer stated that the weight of an individual shell never varied more than seven per cent. This variance was due, it was stated, to the variable viscosity of the gelatin and the moisture content of the air. An additional factor to be taken into consideration is that empty shells made by different manufacturers may show a difference in wall thickness and hence some variation in weight. One manufacturer stated that a 10% error would probably be the maximum. If this be true, then a No. 1 capsule which weighs approximately 80 mg. would show an error of 8 mg. or about $^1/_{10}$ of a grain, which would amount to about a 2% error in a 5-grain capsule.

The following table shows the result obtained by weighing different batches of capsules taken at random from stock.

TABLE I.—WEIGHT EXPRESSED IN GRAMS.

Number in Batch.	No. 0 Capsule. Wt. of Batch.	No. 0 Capsule. Average Wt. per Capsule.	No. 1 Capsule. Wt. of Batch.	No. 1 Capsule. Average Wt. per Capsule.
20	2.1748	0.1087	1.6670	0.0833
20	2.1642	0.1082	1.6540	0.0827
20	2.1780	0.1089	1.6704	0.0835
50	5.3830	0.1076	4.1590	0.0831
50	5.4010	0.1080	4.1165	0.0823
100	10.8230	0.10823	8.1200	0.0812
260—Total				
Average weight per capsule		0.1083		0.0827
Maximum variation per capsule, av. wt.		0.0012		0.0023

	No. 2 Capsule.		No. 3 Capsule.	
20	1.3598	0.0679	1.0566	0.0518
20	1.3610	0.0680	1.0584	0.0524
20	1.3400	0.0670	1.0278	0.0513
50	3.3495	0.0669	2.5770	0.0514
50	3.4000	0.0680	2.4535	0.04907
100	6.7550	0.0675	5.2030	0.0520
260—Total				
Average weight per capsule		0.0675		0.0513
Maximum variation per capsule, av. wt.		0.0010		0.0033

Observing the table it will be noted that the maximum variation in weight per capsule based on the average weight is in the case of the No. 3 capsule. This variation is 3.3 mg. or about five hundredths of a grain. Now by using the average weight 0.0513 this variation is reduced by about one-half, so it could be considered as practically negligible.

Two prescriptions of 12 capsules each were used in Table II. In both cases the theoretical content of the individual capsules was exactly five grains. Two methods were employed in determining the actual contents of each capsule. Method A consisted of weighing the capsule directly on an analytical balance and then subtracting the average weight of the same size empty capsule, as determined in Table I. Method B consisted of emptying the contents of the capsule on to a tared watch glass and then weighing on the analytical balance.

TABLE II.—THE WEIGHTS ARE RECORDED IN GRAMS.

Theoretical weight of 5-grain capsule in Gm. is 0.3240.

	Prescription No. 1.		Prescription No. 2.	
Capsule.	Method A.	Method B.	Method A.	Method B.
1	0.3355	0.3292	0.3013	0.2994
2	0.3303	0.3230	0.3163	0.3100
3	0.3179	0.3036	0.2859	0.2801
4	0.3319	0.3290	0.3243	0.3196
5	0.3067	0.3036	0.3577	0.3480
6	0.2597	0.2532	0.2633	0.2583
7	0.3073	0.2990	0.3163	0.3095
8	0.3443	0.3300	0.3917	0.3900
9	0.3369	0.3368	0.2973	0.2921
10	0.3099	0.3074	0.3133	0.3137
11	0.3189	0.3334	0.3743	0.3682
12	0.3093	0.3094	0.3423	0.3410
Totals	3.8086	3.7576	3.8840	3.8299
	2.83%	3.35%	0.10%	1.52%

Percentage error based on theoretical weight 3.888.

Table II shows that in both instances, using the average weight of the empty shell as a tare, the results were nearer the theoretical. Furthermore, in a comparison of the weight of the contents of individual capsules, the weights obtained by Method A are practically uniform, being slightly higher than the individual weight obtained by Method B.

There are three general methods usually employed in filling capsules by hand. The individual weighing of each capsule is undoubtably the most accurate method, but it is not practical for ordinary dispensing.

The two methods upon which the comparison of accuracy and speed are determined in this paper are:

(1) *The Punching Method*, consisting of filling the capsule directly from the entire quantity of the material either by repeatedly punching the shell in the powder until filled or forcing the powder into the shell by the aid of a spatula.

(2) *The Blocking Method*, in which the material is divided into a uniform square and then into the desired number of divisions, the material in each division being placed in a capsule.

There are several factors to be taken into consideration in the comparison of the accuracy of these two methods. *First*, the comparison must be based upon the quantity of material per capsule, since it is uniform distribution of the material throughout the desired number of capsules that is important. To base it upon the theoretical average weight per capsule determined from the theoretical total weight of the ingredients would not be correct but would merely be a measure of the error

in weighing plus the error in loss of material on the tile, etc. In the case of tolerance establishment this weighing error would be important, but not in a comparison of the accuracy of the two methods of filling. The true index as to the accuracy of filling then must be based upon the distribution of the material contained in the entire lot of capsules, not the amount that should have been placed in them. If, then, the average weight of the contents per capsule is based upon the actual weight of the total contents as determined by weighing on an analytical balance, we have a true estimate as to the quantity each capsule should contain. *Secondly*, the nature of the material would have some effect on the accuracy, so the prescriptions selected, bearing this in mind, consist of: (1) a powder of medium weight and bulk, (2) a bulky powder, (3) a compact powder, (4) a mixture of bulky powders and (5) a mixture of heavy powders. *Third*, the comparison must be based upon the same prescription so every operator filled each prescription twice, once by each method.

The speed factor in hand-filling capsules is important enough in most cases to be considered, but it must not be intimated that accuracy should be sacrificed in order to save time. In determining the time required in the filling operation by the two different methods, it was assumed that since in each method the same weighing and triturations were necessary, the time would be the same. We therefore started measuring time from the point after complete trituration, at which the actual blocking or punching, as the case might be, was started.

The following prescriptions were filled by students of the senior class in Dispensing Pharmacy, at The George Washington University School of Pharmacy. The students were not told that the prescriptions were to be checked for accuracy, but were instructed to fill the first prescription by the blocking method, the second by punching, alternating until all the prescriptions had been filled. At another laboratory period the students were given the same prescriptions and instructed to use the opposite method in filling them than was employed before. In this manner each prescription was filled by each of the two methods and by the same student.

℞ 1	Acidum Acetylsalicylicum	ʒ i	℞ 4	Carbo Ligni		
	m ft. Cap. xii			Phenolphthaleinum	*aa*	gr. ss
℞ 2	Quininæ Sulphas	gr. xxxvi		Acetphenetidinum		
	m ft. Cap. xii			Phenylis Salicylas	*aa*	gr. xx
℞ 3	Bismuthi Subnitras	ʒ i		m ft. Cap. x		
	Ft. Cap. xii		℞ 5	Hydrargyri Chloridum Mite		gr. xii
				Sodii Bicarbonas		gr. xxxvi
				m ft. Cap. xii		

The following tables show the results obtained by each method of filling the prescriptions. In order to have some standard upon which to base the comparison as to the accuracy of the two methods, a ten per cent variance was arbitrarily selected, either plus or minus, from the theoretical average weight of contents per capsule.

TABLE III.—PRESCRIPTION No. 1. Theoretical weight of ingredients in Gm., 3.8880.

Punching Method.

Operator.	Actual Wt. Total Contents of 12 Capsules.	Weighing Error.	Theoret. Wt. per Capsule, Based on Actual Wt. of Total Contents.	No. of Capsules within 10% Error, Plus or Minus.	No. of Capsules Having an Error Greater Than 10%.	Time in Min. to Fill Prescriptions.
1	3.5166	0.3714−	0.2930	7	5	7
2	3.967	0.079+	0.3305	11	1	4
3	3.757	0.131−	0.3130	10	2	9

4	3.9628	0.074+	0.3302	12	0	5
5	3.9242	0.036+	0.3270	9	3	5
6	3.7852	0.1028−	0.3154	8	4	4
7	4.0840	0.196+	0.3605	11	1	6
8	3.9182	0.030+	0.3265	11	1	3
9	3.9956	0.1076+	0.3329	11	1	5
10	4.1756	0.287+	0.3479	10	2	7
Totals				100	20	55
			Blocking Method.			
1	3.823	0.065−	0.3185	8	4	8
2	3.741	0.147−	0.3117	10	2	7
3	3.9946	0.106+	0.3328	6	6	10
4	4.001	0.113+	0.3334	6	6	10
5	3.9672	0.079+	0.3306	8	4	6
6	3.9416	0.0536+	0.3284	10	2	5
7	3.9663	0.078+	0.3305	9	3	9
8	3.8800	0.008−	0.3265	9	3	7
9	3.8100	0.075−	0.3175	10	2	7
10	3.8010	0.087−	0.3167	9	3	8
Totals				85	35	77

TABLE IV.—PRESCRIPTION NO. 2. Theoretical weight of ingredients in Gm., 2.3328.

Punching Method.

Operator.	Actual Wt. Total Contents of 12 Capsules.	Weighing Error.	Theoret. Wt. per Capsule Based on Actual Wt. of Total Contents.	No. of Capsules within 10% Error, Plus or Minus.	No. of Capsules Having an Error Greater Than 10%.	Time in Min. to Fill Prescriptions.
1	2.2932	−0.0396	0.1911	6	6	4
2	2.3768	+0.0440	0.1984	8	4	3
3	2.3708	+0.0380	0.1975	11	1	6
4	2.1396	−0.1932	0.1783	11	1	5
5	2.2656	−0.0672	0.1888	4	8	4
6	2.3036	−0.0292	0.1919	5	7	3
7	2.624	+0.2914	0.2186	10	2	8
8	2.0998	−0.2330	0.1749	10	2	3
9	2.1948	−0.1380	0.1829	10	2	6
10	2.2940	−0.0388	0.1915	12	0	7
Totals				87	33	49
			Blocking Method.			
1	2.3394	+0.0066	0.1949	7	5	9
2	2.2988	−0.0340	0.1916	9	3	9
3	2.5876	+0.2888	0.2156	10	2	6
4	2.3066	−0.0262	0.1922	7	5	11
5	2.3964	+0.0636	0.1977	10	2	8
6	2.3726	+0.0398	0.1969	10	2	6
7	2.3138	−0.0190	0.1928	9	3	10
8	2.7424	+0.4096	0.2287	10	2	8
9	2.2968	−0.0360	0.1914	10	2	8
10	2.4584	+0.1256	0.2048	7	5	6
Totals				89	31	81

TABLE V.—PRESCRIPTION No. 3. Theoretical weight of ingredients in Gm., 3.888.

Punching Method.

Operator.	Actual Wt. Total Contents of 12 Capsules.	Weighing Error.	Theoretical Wt. per Capsule Based on Actual Wt. of Total Contents.	No. of Capsules within 10% Error, Plus or Minus.	No. of Capsules Having an Error Greater Than 10%.	Time in Min. to Fill Prescriptions.
1	3.888	0.000	0.3260	8	4	5
2	3.8688	−0.019	0.3226	5	7	7
3	4.8720	+0.984	0.4060	11	1	3
4	3.9916	+0.103	0.3326	9	3	7
5	4.6544	+0.766	0.3878	8	4	5
6	3.6866	−0.201	0.3072	12	0	5
7	4.0785	+0.1905	0.3398	7	5	7
8	3.7004	−0.187	0.3083	11	1	3
9	4.0240	+0.136	0.3353	5	7	9
10	3.8728	−0.015	0.3227	8	4	5
Totals				84	36	56

Blocking Method.

1	3.9104	+0.022	0.3258	5	7	8
2	3.9330	+0.045	0.3277	8	4	7
3	3.8792	−0.0088	0.3232	6	6	4
4	3.9527	+0.0647	0.3295	8	4	10
5	4.6544	+0.885	0.3978	7	5	3
6	4.072	+0.184	0.3393	8	4	10
7	4.0224	+0.134	0.3352	6	6	14
8	3.7268	−0.161	0.3105	8	4	5
9	4.1314	+0.243	0.3442	12	0	7
10	3.8738	−0.014	0.3228	7	5	6
Totals				75	45	74

TABLE VI.—PRESCRIPTION No. 4. Theoretical weight of ingredients in Gm., 2.6556.

Punching Method.

Operator.	Actual Wt. Total Contents of 12 Capsules.	Weighing Error.	Theoretical Wt. Per Capsule Based on Actual Wt. of Total Contents.	No. of Capsules within 10% Error, Plus or Minus.	No. of Capsules Having an Error Greater Than 10%.	Time in Min. to Fill Prescriptions.
1	3.2298	+0.5742	0.3229	10	0	4
2	2.5690	−0.0866	0.2569	9	1	6
3	2.7284	+0.0728	0.2728	10	0	5
4	2.9516	+0.2960	0.2951	7	3	9
5	2.6064	−0.0492	0.2606	6	4	5
6	2.7308	+0.0752	0.2730	8	2	10
7	2.8246	+0.1690	0.2824	10	0	3
8	3.0372	+0.4816	0.3037	9	1	7
9	2.6270	−0.0286	0.2627	10	0	4
10	2.0410	−0.6146	0.2041	2	8	7
Totals				81	19	60

Blocking Method.

1	2.6382	−0.0174	0.2638	8	2	11
2	2.8260	+0.1704	0.2826	10	0	5
3	2.9838	+0.3282	0.2983	10	0	4
4	2.7166	+0.0610	0.2716	8	2	8
5	2.6072	−0.0484	0.2607	7	3	9
6	2.9600	+0.3046	0.2960	8	2	16
7	2.6722	+0.0166	0.2672	8	2	5
8	2.7014	+0.0458	0.2701	7	3	11
9	2.5394	−0.1162	0.2539	7	3	9
10	2.4910	−0.1646	0.2491	6	4	7
Totals				79	21	85

TABLE VII.—PRESCRIPTION No. 5. Theoretical weight of ingredients in Gm., 3.1104.

Punching Method.

Operator.	Actual Wt. Total Contents of 12 Capsules.	Weighing Error.	Theoretical Wt. per Capsule Based on Actual Wt. of Total Contents.	No. of Capsules within 10% Error, Plus or Minus.	No. of Capsules Having an Error Greater Than 10%.	Time in Min. to Fill Prescriptions.
1	2.9460	−0.1644	0.2455	6	6	4
2	3.5660	+0.4556	0.2972	9	3	5
3	3.2402	+0.1298	0.2700	5	7	6
4	3.2018	+0.0914	0.2668	9	3	6
5	3.2333	+0.1229	0.2693	10	2	5
6	2.7505	−0.3599	0.2292	8	4	7
7	3.0317	−0.0787	0.2526	11	1	4
8	3.0382	−0.0722	0.2531	4	8	3
9	2.9799	−0.1305	0.2483	6	6	4
10	2.8483	−0.2621	0.2373	7	5	6
Totals				75	45	50

Blocking Method.

1	2.9414	−0.1690	0.2452	6	6	6
2	3.1952	+0.0848	0.2663	12	0	7
3	3.7322	+0.6218	0.3110	10	2	5
4	3.2088	+0.0984	0.2674	9	3	8
5	2.9063	−0.2041	0.2422	7	5	8
6	3.0942	−0.0162	0.2578	5	7	11
7	3.0422	−0.0682	0.2535	11	1	5
8	3.0448	−0.0656	0.2537	4	8	4
9	3.0056	−0.1048	0.2508	6	6	7
10	3.0714	−0.0390	0.2559	8	4	7
Totals				78	42	68

SUMMARY OF TABLES III, IV, V, VI AND VII.

Punching Method.

Prescription Number.	Number of Capsules within 10% Error, Plus or Minus.	Number of Capsules Having an Error Greater Than 10%.	Time in Minutes.
1	100	20	55
2	87	33	49

3	84	36	55
4	81	19	60
5	75	45	50
Totals	427	153	269
Percentage of total capsules filled	73.6%	26.4%	
Average time required to fill one capsule			27.6 seconds

Blocking Method.

1	85	35	77
2	89	31	81
3	75	45	74
4	79	21	85
5	78	42	68
Totals	406	174	385
Percentage of total capsules filled	70%	30%	
Average time required to fill one capsule			37.2 seconds

The foregoing tables show a striking uniformity in the degree of accuracy, obtained by average operators, working under ordinary conditions, and filling capsules by punching or blocking methods.

As was expected, the punching method required about 1/3 less time for filling than the blocking method.

Another significant point is that out of the one hundred prescriptions filled only nine came within the arbitrary 10% limit of variance. Of these nine, five were filled by the punching method and four by the blocking method.

CONCLUSIONS.

(1) The comparative accuracy between blocking and punching of capsules is in direct ratio to the skill of the operator.

(2) Considerably less time is required in punching than in blocking and with a comparable degree of accuracy.

(3) The results obtained in this study, which do not contain the weighing error, clearly indicate that a tolerance of more than 10% should be established.

(4) The average weight of an empty gelatin capsule obtained by the method herein described may be used as a tare in determining the weight of filled capsules.

Major General Charles R. Reynolds, the new Surgeon General of the Army, received the degree of M.D. from the University of Pennsylvania in 1899. He entered the service of Medical Corps of the army in 1900 and served through the various grades to Colonel and entered upon his duties as Surgeon General June 2, 1935. He served in the Philippines and had a brilliant record during the World War; was awarded the Distinguished Service Medal and the Silver Star and is an officer of the French Legion of Honor. He has written many professional papers having a bearing on military medical matters.

Dr. James F. Couch, chemist of the Bureau of Animal Industry of the Department of Agriculture and professor of historical science at the National University, has been elected president of the Chemical Society of Washington, D. C.

The New York Pharmacist, with the April issue, became the property of the New York State Pharmaceutical Association and is now known as the *New York State Pharmacist.*

DETERMINATION OF THE REASONABLE OR PERMISSIBLE MARGIN OF ERROR IN DISPENSING. V. LIQUIDS.*

BY MARVIN J. ANDREWS.[1]

INTRODUCTION.

In the first paper of this series, it was stated that the different types of prescriptions which the pharmacist is ordinarily called upon to fill may be divided, roughly, into two groups, namely, liquids and solids. The four papers presented to date deal only with the more frequently encountered types of the latter, *viz.*: Powders and Capsules (1); Ointments (2); Suppositories (3); and Pills (4). This, the fifth paper of the series, deals with Liquids.

Liquids called for on prescriptions are usually measured, the volume in most cases, being determined by using either a cylindrical or conical graduate. The possibilities for error in measuring a definite volume of a liquid are greater in number than is commonly held. Fortunately, most of them may be ignored as the error involved is too small to be of practical significance. In fact, only three need be considered for the purpose of this study. They are believed to be, in the order of their importance: (1) the nature of the liquid to be measured, (2) the shape and size of the graduate used, and (3) the personal equation. To determine to what extent each of these factors is responsible for the total deviation from the standard, the studies reported in this paper were undertaken.

EXPERIMENTAL PART.

For the purpose of the study reported in this paper, two series of tests were made. The object of the first was to determine the relationship, if any, between the size and shape of the graduate used and the magnitude of the observed error in the measurement of definite volumes. The object of the second was to determine to what extent the magnitude of error was effected by certain physical properties of liquids, such as color, viscosity, etc.

In the actual performance of these tests, the liquids were measured in both cylindrical and conical graduates by 100 members of the senior class in dispensing pharmacy at the School of Pharmacy of the University of Maryland. In each case the liquid was poured from a quart bottle into the graduate, held in the hand of the dispenser, then transferred to a prescription bottle. The contents of the bottle were again transferred to a tared container and accurately weighed on a chainomatic balance. The temperature of the liquids in both series of tests ranged from 22° C. to 25° C.

Each dispenser was assigned a definite number so the variation in the work of any individual could be followed throughout both series. The weight of all measurements is reported.

SERIES I.

In the first series of tests definite volumes of distilled water were measured by the dispenser in 10-, 25-, 50- and 100-cc. cylindrical and conical graduates.

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* Joint Session, Scientific Section and Section on Practical Pharmacy and Dispensing, A. PH. A., Washington meeting, 1934.

[1] In collaboration with A. G. DuMez, Professor of Pharmacy, School of Pharmacy, University of Maryland.

The results of the first series of tests are presented in Table I.

TABLE I.—EFFECT OF SIZE AND SHAPE OF GRADUATE ON MEASUREMENT OF DEFINITE VOLUMES OF LIQUID.

Dispenser Number.	10 Cc.		25 Cc.		50 Cc.		100 Cc.	
	Cyl.	Con.	Cyl.	Con.	Cyl.	Con.	Cyl.	Con.
1.	9.579	9.555	24.653	24.510	49.457	48.285	98.283	98.052
2.	9.647	9.860	24.615	23.957	49.801	48.653	98.048	99.242
3.	9.855	9.718	24.812	24.474	49.593	48.890	98.439	98.917
4.	9.653	9.410	23.622	25.231	49.417	47.836	96.715	96.637
5.	9.528	9.523	24.550	24.219	50.208	46.385	99.313	98.319
6.	9.729	9.798	24.742	24.354	49.659	46.385	98.902	97.343
7.	9.343	9.948	24.961	24.856	49.835	48.689	98.002	101.368
8.	9.373	9.529	23.444	24.745	49.140	47.379	97.815	93.970
9.	9.691	10.004	24.995	24.501	49.789	50.147	99.046	100.590
10.	9.227	9.182	24.287	22.919	48.841	47.253	97.673	98.600
11.	9.718	9.778	24.716	23.710	50.022	46.766	98.745	95.200
12.	9.455	9.586	24.383	23.721	48.842	48.948	97.804	96.911
13.	9.517	9.584	25.626	24.328	50.023	49.023	98.705	96.561
14.	9.700	9.459	24.704	22.910	49.400	48.177	98.942	93.812
15.	9.401	9.965	24.170	24.462	50.081	49.300	98.773	98.995
16.	9.717	9.632	24.336	23.848	48.964	48.553	98.478	99.201
17.	9.487	9.620	24.340	23.339	48.787	47.335	97.637	100.009
18.	9.674	9.792	24.535	24.669	49.484	50.331	98.548	99.264
19.	9.660	9.533	24.829	25.110	49.333	49.842	99.523	100.424
20.	9.561	9.944	24.170	25.135	50.170	50.036	98.753	99.740
21.	9.475	9.768	23.844	24.729	49.047	49.475	98.534	98.856
22.	9.130	9.484	24.500	24.481	49.312	49.553	97.866	96.409
23.	9.617	9.838	24.765	24.610	50.024	49.784	98.741	98.443
24.	9.617	9.951	24.905	24.604	49.131	49.362	98.400	98.777
25.	9.844	9.600	24.177	23.843	49.152	47.778	97.963	97.034
26.	8.985	8.748	24.418	23.986	49.015	47.681	98.212	94.765
27.	9.620	10.000	24.936	23.584	47.962	47.351	98.311	95.958
28.	9.231	9.145	24.060	23.642	47.910	48.739	97.456	95.683
29.	9.515	9.664	24.830	23.274	49.927	50.154	97.603	98.490
30.	9.600	9.810	24.775	24.476	49.727	49.469	98.353	100.326
31.	9.258	9.081	21.951	24.130	49.154	49.673	98.389	99.169
32.	9.572	9.354	24.655	23.406	49.746	48.444	95.119	95.420
33.	9.661	9.779	24.686	24.867	49.978	50.067	98.871	100.131
34.	9.522	9.843	23.980	23.851	49.537	48.623	98.605	99.491
35.	9.355	9.681	24.880	24.296	48.877	50.013	97.450	96.529
36.	9.284	9.377	24.556	24.252	48.741	48.459	98.537	96.729
37.	9.636	9.417	24.302	23.104	49.365	47.971	100.021	97.117
38.	9.654	9.568	24.445	24.829	50.472	49.367	98.440	98.608
39.	9.385	9.577	24.246	24.476	49.500	51.393	98.250	97.262
40.	9.540	9.601	23.355	24.021	46.653	49.337	97.403	98.365
41.	9.505	9.250	24.542	24.161	48.670	49.170	98.262	96.100
42.	9.476	9.408	23.986	23.359	48.353	47.907	97.661	97.286
43.	9.537	9.454	24.441	23.058	49.400	49.000	98.444	95.646
44.	9.832	9.705	24.920	24.470	49.521	49.221	98.540	96.049
45.	9.349	9.753	24.674	24.247	49.751	49.911	98.623	98.312
46.	9.337	9.337	24.500	21.000	49.298	45.857	97.865	98.800
47.	9.208	9.263	24.620	23.809	47.842	49.876	98.601	93.335
48.	9.567	9.202	24.362	24.107	48.875	49.205	97.904	96.937
49.	9.588	9.571	24.304	23.119	49.344	49.308	98.341	94.980
50.	9.235	9.772	22.684	25.102	49.928	49.272	97.600	96.069

51.	9.604	9.004	24.352	22.985	49.055	47.230	98.974	96.120
52.	9.515	10.209	25.003	24.107	49.653	48.348	98.210	99.056
53.	9.476	9.606	24.448	23.504	49.764	49.676	98.479	98.191
54.	9.510	9.842	24.608	24.445	49.744	49.228	98.461	97.565
55.	9.817	10.075	25.416	23.201	49.194	49.006	97.981	97.134
56.	9.601	9.348	24.376	23.210	49.341	48.258	98.003	99.001
57.	9.556	9.406	24.431	23.613	48.353	47.633	98.242	99.705
58.	8.943	9.468	24.347	24.782	49.971	47.843	97.970	98.831
59.	9.638	9.550	24.391	23.562	47.342	48.668	98.003	96.674
60.	9.660	10.301	24.239	23.504	49.396	47.962	98.966	97.748
61.	9.949	9.671	23.998	24.200	47.902	49.941	98.827	97.990
62.	9.777	9.864	24.539	23.121	50.155	48.261	97.050	97.957
63.	9.682	9.038	24.952	24.452	50.065	49.724	98.937	100.421
64.	9.452	9.262	23.641	23.490	49.078	48.531	97.730	100.348
65.	9.708	9.702	24.601	23.556	49.762	49.783	98.551	95.742
66.	9.678	9.910	24.640	24.228	48.741	49.190	98.320	99.311
67.	9.523	9.790	24.503	23.727	49.622	50.169	98.882	98.009
68.	9.501	9.164	24.107	22.746	49.104	47.386	98.816	98.612
69.	9.938	9.726	24.955	24.945	49.940	50.860	99.830	97.723
70.	9.573	9.587	24.872	24.900	49.590	48.976	97.631	96.867
71.	9.912	9.716	24.182	22.911	47.654	49.829	98.506	99.004
72.	9.721	9.543	24.748	22.733	47.820	46.303	98.209	94.402
73.	9.357	9.543	23.126	24.283	47.124	49.100	94.564	98.696
74.	9.453	9.712	24.389	21.795	49.281	48.472	98.872	97.838
75.	9.588	9.739	24.941	24.481	49.502	49.777	98.768	97.594
76.	9.485	9.229	24.633	23.268	49.239	50.036	98.002	98.753
77.	9.483	10.035	24.913	24.076	49.046	48.921	98.470	99.126
78.	9.732	9.451	24.105	24.929	49.835	46.891	98.422	96.770
79.	9.462	9.383	24.314	23.709	49.876	49.834	98.104	98.163
80.	9.589	9.678	24.483	23.771	49.186	49.260	98.683	96.768
81.	9.733	10.028	25.007	23.928	49.644	48.386	99.172	97.804
82.	9.740	9.681	24.510	23.674	48.765	50.984	98.644	99.433
83.	9.667	9.760	24.590	24.184	49.776	47.566	98.238	95.723
84.	9.629	9.630	24.710	24.740	49.386	49.937	98.636	100.388
85.	9.819	10.151	24.814	24.281	49.663	48.447	98.907	100.233
86.	9.637	9.469	24.933	24.912	49.763	48.885	96.876	99.423
87.	9.369	9.365	24.799	24.043	48.065	50.226	97.986	98.149
88.	9.637	9.722	24.988	24.341	48.382	47.635	97.380	97.932
89.	9.466	9.691	24.905	24.307	48.363	45.516	98.780	101.177
90.	9.506	9.512	24.292	24.178	49.374	49.783	98.389	99.905
91.	9.650	9.108	24.777	23.876	48.350	47.031	98.704	94.353
92.	9.991	9.104	24.835	24.202	49.601	47.561	96.550	99.961
93.	9.596	10.228	24.669	24.525	49.128	50.146	98.722	99.547
94.	9.623	9.349	24.763	24.892	49.104	49.582	98.315	97.081
95.	10.651	9.876	24.339	23.653	50.102	46.783	97.014	101.900
96.	9.484	9.806	24.341	24.256	50.653	47.343	98.333	99.502
97.	9.292	9.402	24.349	23.406	49.876	51.437	98.136	96.332
98.	9.154	9.135	24.687	23.778	49.783	48.106	98.268	98.030
99.	9.724	9.630	24.678	24.040	49.386	48.462	98.336	96.668
100.	9.203	9.973	25.067	24.103	49.336	47.286	97.643	94.192
Av. Wt.	9.561	9.606	24.481	23.994	49.258	48.758	98.240	97.881
S. D.*	0.224	0.290	0.503	0.708	0.727	1.203	0.767	1.802
% D[1]	2.34%	3.11%	2.05%	2.95%	1.48%	2.47%	0.78%	1.84%

* Standard Deviation expressed in grams.

[1] Percentage Deviation based on average weight.

The tabulated data given in Table I shows there is an error due to the size and shape of the graduate. The magnitude of error is considerably greater when a conical graduate is used than when a cylindrical graduate is used. With respect to size just the opposite is true, the larger the graduate and the larger the volume measured the smaller the per cent of error. For instance in the measurement of 10 cc. of distilled water in a cylindrical graduate the average error based on the standard deviation amounted to 2.34%. When a 10-cc. conical graduate was used it amounted to 3.11%. That the magnitude of the error is greater when the smaller graduate was used than when the larger graduate was used is shown when the volume measured was 100 cc., and a 100-cc. graduate was used in making the measurements, the average error amounted to only 0.78% in the case of the cylindrical graduate and 1.84% in the case of the conical graduate.

The error due to the personal equation is naturally indefinite. In fact, it was found to be impractical to attempt to measure it separately. The error is revealed by a definite trend in a series of measurements made by an individual rather than by the observation made on a single measurement. For example, in the series of measurements made by dispenser number 1 it will be observed that a majority of the measurements here were high when compared with the average, while those of dispenser number 10 were below the average.

No effort was made to determine what the personal equation was in these cases so that an accurate statement cannot be made concerning its nature. In some cases it may have been the result of defective vision, in others it may have been due to natural carelessness, in other instances it may have been due to using the upper meniscus at times and at other times the lower meniscus for making measurements, or to some other trait of the individual making the measurements.

The results presented in Table I are summarized in Table II, which follows. This table shows the actual number of measurements falling within the standard deviation and multiples thereof. Furthermore, the table shows the per cent of measurements falling within any one group, since the total number of measurements made in each case was exactly 100.

TABLE II.—SUMMARY OF RESULTS PRESENTED IN TABLE I.

Liquid to Be Measured.	Volume Measured in Cc.	Shape of Graduate Used.	Average Weight in Gm.	Standard Deviation in Gm.	Number of Measurements Falling within 1 × S. D.	2 × S. D.	3 × S. D.	4 × S. D. or Over.
Distilled Water	10	Cyl.	9.561	0.224	78	19	2	1
Distilled Water	10	Con.	9.606	0.290	70	25	5	0
Distilled Water	25	Cyl.	24.481	0.503	85	9	4	2
Distilled Water	25	Con.	23.994	0.708	68	30	0	2
Distilled Water	50	Cyl.	49.258	0.727	74	22	3	1
Distilled Water	50	Con.	48.758	1.203	69	26	5	0
Distilled Water	100	Cyl.	98.240	0.767	83	12	3	2
Distilled Water	100	Con.	97.881	1.802	67	28	5	0

The second series of tests was conducted to determine the effect of certain physical properties of liquids on the measurement of a definite volume. With this object in view the following liquids were selected:

(1) Elixir of Iron, Quinine and Strychnine, N. F., as a green colored liquid; (2) Syrup, U. S. P., as a viscous clear liquid; (3) Milk of Magnesia, U. S. P., as an opaque liquid; and (4) Castor Oil, U. S. P., as an oily liquid.

To obtain comparative data, the same cylindrical and conical graduates used in measuring the 100 cc. of Distilled Water in the first series of tests, were used in this series. The results of the second series of tests are given in Table III.

TABLE III.—EFFECT OF CERTAIN PHYSICAL PROPERTIES OF LIQUIDS ON THE MAGNITUDE OF ERROR.

Elixer I. Q. S.		Syrup.		Milk of Magnesia.		Castor Oil.		Dispenser Number.
Cyl.	Con.	Cyl.	Con.	Cyl.	Con.	Cyl.	Con.	
103.912	105.721	126.239	130.634	94.277	95.533	81.218	94.358	1.
104.616	105.169	125.316	128.371	101.501	93.585	90.491	87.204	2.
104.352	103.355	118.564	129.030	93.607	92.510	89.362	84.856	3.
104.251	104.403	123.108	126.035	94.705	101.491	89.300	82.680	4.
104.318	106.825	125.292	126.832	97.774	99.214	85.930	90.081	5.
103.256	101.860	122.514	129.866	94.000	93.933	84.333	84.352	6.
104.318	100.819	126.471	122.857	98.027	89.337	86.222	93.861	7.
101.712	101.838	124.300	124.772	92.631	88.506	89.515	85.641	8.
104.643	103.834	125.084	129.579	93.107	99.102	89.801	87.405	9.
103.953	100.100	126.656	120.159	93.239	88.941	89.086	80.474	10.
104.229	101.246	124.049	123.073	95.097	100.287	92.100	87.673	11.
104.054	102.125	125.450	122.511	90.924	90.785	91.311	84.130	12.
104.375	105.640	127.315	128.417	99.762	100.747	86.416	87.381	13.
103.088	100.714	125.833	127.586	92.725	93.730	84.803	86.960	14.
104.122	103.030	124.522	130.190	91.873	93.310	88.876	82.388	15.
104.451	105.937	125.141	130.632	91.260	92.836	91.340	92.253	16.
103.743	102.488	123.965	123.376	93.453	94.687	87.587	90.040	17.
104.442	104.002	121.520	126.646	97.266	96.361	86.889	91.420	18.
104.882	107.639	124.420	127.288	99.424	94.666	85.829	86.264	19.
104.455	107.165	124.510	133.900	93.595	101.015	90.888	88.206	20.
103.505	106.843	121.258	123.896	92.909	91.051	89.712	89.914	21.
104.383	103.567	127.533	129.635	95.747	96.066	91.535	90.416	22.
104.417	107.950	128.727	132.664	98.576	96.087	89.151	89.097	23.
103.758	103.323	124.188	132.217	92.377	93.932	95.985	97.780	24.
103.455	98.961	125.296	121.748	94.776	94.764	91.856	89.042	25.
101.128	103.885	124.703	128.611	92.271	96.410	81.262	84.076	26.
104.200	105.251	124.510	129.791	93.438	97.810	80.374	89.891	27.
103.290	101.965	125.746	123.473	93.091	91.271	87.200	85.853	28.
102.850	103.075	124.602	125.312	94.425	95.168	83.950	82.057	29.
104.991	103.581	122.672	132.161	98.744	100.002	84.442	85.214	30.
102.492	104.034	120.040	125.252	92.776	91.035	85.150	83.727	31.
103.902	102.730	123.021	125.508	90.431	93.059	82.224	79.224	32.
104.053	101.387	127.582	134.551	93.784	93.823	88.900	88.389	33.
104.392	102.056	127.613	126.704	97.487	98.066	93.470	84.637	34.
103.792	103.585	124.763	125.242	93.981	91.906	87.990	88.673	35.
104.267	108.794	123.323	127.172	93.381	92.345	77.756	78.931	36.
103.580	103.600	122.779	124.210	92.234	96.937	78.873	74.778	37.
106.219	103.783	124.039	129.918	94.546	98.823	82.670	84.768	38.
104.002	104.135	121.910	127.921	96.919	93.900	81.307	86.300	39.
104.379	105.932	123.700	125.678	94.222	98.302	91.318	81.351	40.
103.973	104.077	120.211	120.660	95.040	90.997	90.588	83.593	41.
103.472	104.082	124.862	123.270	97.088	92.449	78.413	99.688	42.
103.874	98.793	123.566	126.066	94.700	94.738	87.579	87.730	43.
104.048	103.592	124.363	128.529	92.859	93.882	88.885	81.158	44.
103.728	103.366	123.234	127.907	93.537	100.837	83.584	82.365	45.
103.920	102.187	121.090	122.183	92.327	90.486	86.873	83.277	46.
104.056	102.192	127.164	125.773	91.200	91.680	88.609	83.551	47.
103.881	105.031	124.634	127.411	93.643	94.768	87.549	79.439	48.
101.942	105.649	123.814	127.059	94.200	94.830	86.533	81.672	49.
100.130	104.144	125.064	125.902	97.102	91.874	87.589	97.041	50.

104.220	100.849	127.508	125.815	92.304	95.114	92.705	86.443	51.
104.221	105.980	126.184	131.553	94.949	96.272	88.733	86.821	52.
104.251	98.261	125.672	134.053	96.126	99.537	87.221	94.999	53.
105.263	106.625	123.988	127.516	101.291	93.279	88.736	95.194	54.
104.257	103.140	120.802	123.582	96.449	95.500	86.825	86.491	55.
104.013	106.221	121.343	125.064	94.508	97.651	88.382	80.959	56.
106.003	104.612	122.952	129.540	89.383	94.970	87.486	91.723	57.
104.583	104.248	127.944	125.593	98.427	96.228	90.490	88.451	58.
103.788	107.811	125.285	125.868	92.978	94.715	94.942	89.894	59.
102.384	104.025	117.325	124.333	91.980	94.233	84.364	87.272	60.
102.681	99.258	123.321	125.324	88.832	89.121	91.836	84.651	61.
103.377	107.395	126.056	132.802	94.200	97.115	87.321	89.336	62.
106.615	104.880	126.326	130.639	95.236	94.993	87.749	93.265	63.
105.527	104.623	120.935	125.761	100.304	94.160	83.647	88.772	64.
103.265	101.985	122.343	122.693	96.382	99.416	89.280	85.191	65.
103.527	99.563	124.384	122.876	91.104	96.403	91.630	84.180	66.
104.051	106.786	124.678	130.639	94.507	93.300	85.676	81.684	67.
105.357	106.001	125.565	123.774	99.909	94.948	96.776	87.603	68.
103.902	103.663	124.621	126.795	93.430	93.915	85.690	87.116	69.
104.778	105.370	125.859	129.509	99.742	95.432	83.529	84.965	70.
103.690	102.844	125.231	122.525	95.461	94.111	87.325	79.603	71.
103.672	100.578	118.993	121.108	93.729	90.062	96.146	97.798	72.
104.872	104.530	124.484	125.028	93.606	96.050	84.382	88.743	73.
105.477	103.923	123.120	123.579	93.428	94.127	87.175	86.262	74.
104.452	104.038	122.561	128.706	96.711	96.045	84.589	91.220	75.
104.005	105.483	126.936	122.363	95.369	98.710	91.365	94.323	76.
103.714	104.935	125.758	133.774	94.805	94.350	92.787	81.604	77.
104.162	105.057	125.101	127.424	98.728	94.779	86.487	89.463	78.
103.610	101.683	126.802	123.945	93.347	97.996	86.170	81.147	79.
103.334	101.810	126.740	123.543	95.250	95.584	91.765	88.502	80.
104.536	104.403	124.763	129.183	98.730	94.618	96.881	81.361	81.
105.631	103.457	120.999	125.440	95.672	97.335	88.461	87.732	82.
104.727	100.157	123.364	127.942	95.661	92.308	85.395	95.156	83.
105.006	104.987	127.376	129.519	96.100	94.585	95.601	82.397	84.
103.679	105.343	124.122	124.110	100.375	101.652	88.649	88.760	85.
105.104	106.424	123.428	124.300	94.899	99.031	85.031	87.515	86.
105.643	105.707	121.417	127.986	93.390	98.470	88.463	74.383	87.
104.325	100.955	122.765	125.045	95.588	94.613	87.637	91.687	88.
103.762	100.040	125.502	127.800	95.347	92.327	88.473	89.579	89.
103.624	105.794	118.640	121.091	93.493	97.000	85.368	84.652	90.
104.133	106.505	124.335	130.632	94.240	101.964	88.912	89.571	91.
104.876	105.122	126.255	129.312	96.400	101.782	87.251	90.784	92.
103.272	103.505	123.035	129.669	96.662	100.734	91.328	96.646	93.
104.018	106.061	128.643	126.387	97.483	95.602	88.151	99.648	94.
104.051	99.018	125.340	128.006	94.307	94.328	85.337	87.934	95.
104.688	104.350	129.288	125.665	95.670	99.775	81.565	84.572	96.
103.672	104.531	129.780	129.822	92.445	91.839	86.861	75.121	97.
103.676	98.521	122.793	120.471	90.347	90.370	80.845	85.813	98.
103.395	103.320	122.176	127.747	93.527	95.846	94.033	86.527	99.
104.783	107.346	120.760	121.229	100.674	95.201	86.130	86.941	100.
104.049	103.752	124.298	126.753	94.895	95.254	87.742	87.017	Av. Wt.
0.926	2.329	2.368	3.333	2.644	3.151	3.938	5.087	S. D.*
0.89%	2.24%	1.91%	2.63%	2.79%	3.31%	4.49%	5.85%	% D.[1]

* Standard Deviation expressed in grams.

[1] Percentage Deviation based on average weight.

The foregoing tabulation shows that errors are made in measurement and therefore the deviation from the standard is affected by the nature of the liquid measured. The magnitude of the error observed was in the following order: Distilled Water, Elixir of Iron, Quinine and Strychnine, Syrup, Milk of Magnesia and Castor Oil. The physical properties responsible for the great part were found to be color and viscosity.

The data presented in Table III reveal that color in a liquid has a tendency to increase the magnitude in error made in measurement, for example: the average error for 100 cc. of Distilled Water measured in a cylindrical graduate is 0.78%, while that of the green-colored liquid, Elixir of Iron, Quinine and Strychnine is 0.89%.

A similar effect was observed with respect to viscosity. In the case of Distilled Water the average error was 0.78% as previously stated, whereas the average error found in the measurement of Syrup was 1.91%, and for Castor Oil was 4.49%.

The large error in the case of Castor Oil is no doubt due to the fact that the refractive index of Castor Oil is so near that of glass that the adherence of the oil to the sides of the graduate is not detected and not sufficient time is allowed by the dispenser for complete drainage.

Milk of Magnesia while not a liquid in the true sense of the word is nevertheless generally dispensed by volume rather than by weight, hence it must be measured. It was therefore included in this series of experiments. The comparatively large error found in this instance was no doubt due to the adherence of a considerable amount of the magnesium hydroxide to the inside of the glass graduate from which it was impossible to drain it, but could be readily seen. The average error amounted to 2.79% as compared with that of Distilled Water which was 0.78%.

The results of Table III are best summarized in Table IV.

TABLE IV.—SUMMARY OF RESULTS PRESENTED IN TABLE III.

Liquid to Be Measured.	Volume Measured in Cc.	Shape of Graduate Used.	Average Weight in Gm.	Standard Deviation in Gm.	Number of Measurements Falling within 1 × S. D.	2 × S. D.	3 × S. D.	4 × S. D or Over
Distilled Water	100	Cyl.	98.240	0.767	83	12	3	2
Elix. I. Q. & S.	100	Cyl.	104.049	0.926	79	14	5	2
Syrup	100	Cyl.	124.298	2.368	69	25	6	0
Milk of Magnesia	100	Cyl.	94.895	2.644	73	20	7	0
Castor Oil	100	Cyl.	87.742	3.938	72	21	7	0
Distilled Water	100	Con.	97.881	1.802	67	28	5	0
Elix. I. Q. & S.	100	Con.	103.752	2.329	70	25	5	0
Syrup	100	Con.	126.753	3.333	68	28	4	0
Milk of Magnesia	100	Con.	95.254	3.151	65	30	5	0
Castor Oil	100	Con.	87.017	5.087	70	24	6	0

To make it possible to compare the results given in Tables I and III with similar data that may have been published, but which have not been expressed in terms of the standard deviation, the per cent deviation from the average weight has been calculated and is given in Table V.

TABLE V.—PERCENTAGE OF ERROR COMPUTED FROM DATA IN TABLES I AND III.

Liquid to Be Measured.	Volume Measured in Cc.	Shape of Graduate Used.	Average Weight in Gm.	Number of Measurements Falling within 1%.	2%.	3%.	4%.	5%.	6%.	7%.	8%.	9%.	10% or More.
Distilled Water	10	Cyl.	9.561	4	5	11	24	22	13	9	8	2	2
Distilled Water	10	Con.	9.606	11	9	19	14	14	11	7	5	6	4
Distilled Water	25	Cyl.	24.481	27	29	24	9	4	2	2	1	0	2
Distilled Water	25	Con.	23.994	13	9	18	16	10	13	7	6	4	4
Distilled Water	50	Cyl.	49.258	55	33	8	2	1	1				
Distilled Water	50	Con.	48.758	29	23	30	7	6	4	1			
Distilled Water	100	Cyl.	98.240	89	9	0	2						
Distilled Water	100	Con.	97.881	38	34	18	7	3					
Elix. I. Q. & S.	100	Cyl.	104.049	82	12	5	1						
Elix. I. Q. & S.	100	Con.	103.752	38	26	18	9	7	2				
Syrup	100	Cyl.	124.298	45	27	18	4	5	1				
Syrup	100	Con.	126.753	30	18	24	14	9	4	1			
Milk of Magnesia	100	Cyl.	94.895	30	26	18	9	7	6	4			
Milk of Magnesia	100	Con.	95.254	29	20	12	12	11	7	7	2		
Castor Oil	100	Cyl.	87.742	22	20	11	11	15	3	2	6	3	7
Castor Oil	100	Con.	87.017	19	10	17	13	4	7	9	3	5	13

NOTE: All percentages are calculated from the average weight. 1% = 1% or less; 2% = from 1% plus to 2%; etc.

For the purpose of comparison with previously published data it is also desirable to have information showing the percentage of the total measurements in which the error falls below certain magnitudes, the latter being expressed in terms of per cent. The following table is intended to accomplish this purpose.

TABLE VI.—TABLE SHOWING THE MAXIMUM PER CENT OF ERROR IN 90% OF THE MEASUREMENTS RECORDED IN TABLE V.

Shape of Graduate.	Distilled Water. 10 Cc.	25 Cc.	50 Cc.	100 Cc.	Elix. I. Q. & S. 100 Cc.	Syrup 100 Cc.	Milk of Magnesia 100 Cc.	Castor Oil 100 Cc.
Cyl.	8%	5%	3%	2%	2%	3%	5%	8%
Con.	8%	8%	5%	3%	4%	5%	6%	10%

CONCLUSIONS.

1. The factors largely responsible for the errors made by pharmacists in the measurement of specified volumes were found to be three in number. These are in the order of their importance: (1) The nature of the liquid to be measured, (2) the shape and size of the graduate used, and (3) the personal equation.

The error due to the personal equation naturally cannot be predicted with any degree of accuracy as it depends entirely upon the idiosyncrasy of the individuals making the measurements. In some instances it may far exceed one or both of the other two factors but in all of the measurements made in the foregoing series of tests it exceeded twice the standard deviation in less than 7 per cent of all cases.

2. From the data obtained in the tests made it would seem that twice the standard deviation is a reasonable margin of error for the measurement of the volume of liquids. A margin of this magnitude will permit the acceptance of the following:

Shape of Graduate.	Distilled Water. 10 Cc.	25 Cc.	50 Cc.	100 Cc.	Elix. I. Q. & S. 100 Cc.	Syrup 100 Cc.	Milk of Magnesia 100 Cc.	Castor Oil 100 Cc.
Cyl.	97%	94%	96%	95%	93%	94%	93%	93%
Con.	95%	98%	95%	95%	95%	96%	95%	94%

REFERENCES.

(1) Andrews, Marvin J., JOUR. A. PH. A., 22, 755 and 838 (1933).
(2) Andrews, Marvin J., *Ibid.*, 23, 350 and 421 (1934).
(3) Andrews, Marvin J., *Ibid.*, 23, 1003 (1934).
(4) Andrews, Marvin J., *Ibid.*, 23, 1117 and 1210 (1934).

UNITED STATES PATENTS GRANTED FOR MEDICINES DURING THE PIONEER YEARS OF THE PATENT OFFICE.*

BY LYMAN F. KEBLER.[1]

The word "patent" means open, not secret. A patent cannot be granted for a medicine of secret composition. The term "Patent Medicine" applied to a medicine of secret composition is a misnomer. The term in general conveys an erroneous impression. Many think that all proprietaries, foods and drugs, and medicines in package form, are of secret composition and consequently plain frauds. It is true that some outright medical frauds have been and still are perpetrated on the suffering sick. And this is true even in the case of a goodly number of medicines for which patents have been granted. Patenting a product does not preclude telling fairy tales about it. In fact, the therapeutic claims contained in the description of some of the patents for medicines are grossly false and fraudulent, as will be pointed out later.

SOME INTERESTING PHASES IN PATENTING MEDICINES.

Secret medicines with their air of mysticism have held sway for the ages in all lands. The alchemistic era produced some of the most phony ideas in the matter of the philosopher's stone being a universal medicine and panacea. Secret medicines made marked advances during the time of iatrochemistry, when Paracelsus (1493–1541), with his *lapis infernales*, held sway, and John R. Glauber (1610–1770), the distinguished physician-chemist and discoverer of Glauber's salt, played such prominent parts. Glauber not only discovered the salt named after him but ascertained its medicinal virtues and sold it at a handsome profit under the name *sal mirabile*, for many years. It is claimed that he made a living selling secret medicines.

England set a precedent in granting patents to medicines. Among the earliest may be mentioned "Dr. Bateman's Pectoral Drops" (1726), "Dr. James' Fever Powder" (1747), "Ann Pike's Ointment for the Cure of Cutaneous Eruptions" (1760), and "Gale's Spa Elixir" (1782). The Ann Pike Ointment is probably one of the most glaring of frauds. It is a mixture of pomatum, lard, deer suet, calomel, Jesuits' bark, quicksilver, turpeth mineral, tutty powder, flowers of brimstone and "wood sut." The patent alleges that it is a "Grand Antidote for the Itch and All

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* Section on Historical Pharmacy, A. PH. A., Washington meeting, 1934.

[1] Former Chief of Drug Division, Bureau of Chemistry, United States Department of Agriculture.

Scorbutic Humors, a Sovereign and Efficatious Remedy that never fails all Erruptions and Cutaneous Disorders . . . ." The manner of use is to rub a quantity the size of a pea, every night for a fortnight in the palms of the hands.

In 1641 the General Court of Massachusetts Bay granted a 10-year patent for a novel method of making salt. The same province granted a patent for life for an invention for warming houses. Maryland issued a patent for a steam carriage in 1787. I have not come across a patent issued in favor of any medicine by any Colonial Government. It should be said, however, that secret medicines were freely sold in the colonies, among them Gov. John Winthrop's "Rubila," "Muirson's Mercurial Ointment" and "Digby's Sympathetic Powder." The latter had the sanction of Harvard College.

The colonists brought with them a demand for the remedies of their home country. The English Patent Medicines were as commonly used as laudanum and castor oil. Their nature and character were generally well known.

THE BEGINNING OF PATENTS IN THE UNITED STATES.

Our National Constitution gives Congress the power to "Promote the progress of science and useful arts by securing, for a limited time, to authors and inventors, the exclusive right to their respective writings and discoveries." The first law under this provision was enacted April 10, 1790. It provided for a board consisting of the Secretaries of State and War, the Attorney-General and the President . . . . The Executive power was simply signatory. The first board consisted of Thomas Jefferson, Secretary of State; Henry Knox, Secretary of War; and Edmund Randolph, Attorney-General. The first United States patent granted was issued to Samuel Hopkins, July 31, 1790. It covers a process for the manufacture of "Pot and Pearlash." No copy is available. The earliest patent, of which a copy is available and displayed in the patent office, was issued to Francis Bailey, January 29, 1791. It outlines methods for making punches, for manufacturing letters, and designs for printing. The patent was signed by George Washington, the President; Thomas Jefferson and Edmund Randolph, Attorney-General. No grant for any medicine was issued under the law of 1790.

A new law was passed in 1793. Up to 1802 the clerk in the State Department handled all of the patent office work. It is alleged that patents were granted for apparently trivial and ridiculous inventions. In this connection it is interesting to note that the first United States patent, dealing with therapeutic matters, was issued in 1796 to Elisha Perkins, a physician of Connecticut. Its title reads:[1] "Removing Pain, etc., by Metallic Points." The devices are usually referred to as "Perkins' Tractors,"[2] and are ridiculed as the acme of fraud. Yet, some of the leading physicians of the times purchased and used them with apparent satisfaction. There is no copy of this patent available in the United States, the reason being that a disastrous fire in 1836 destroyed the entire office, including the records, patents, drawings and designs. Fortunately, Congress published Indexes from time to time, copies of which were filed elsewhere and were saved. In these documents are preserved the titles of the patents issued.

A patent for these tractors was granted[3] in England to Benjamin Douglas Perkins, a son of Elisha Perkins, March 10, 1798, under the title, "Application of

[1] List of Patents Granted by the United States, 1790–1836.

[2] Jour. A. Ph. A., 22, 1142 (1933). [3] Specifications of Patents, England, No. 2221, 1798.

Galvanism as a curative agent." The basis therefore was galvanism, that held such sway at the time. The tractors most eminently efficacious for removing disease were claimed to be combinations of copper, zinc, with small proportions of iron, silver, gold or platinum. The diseases enumerated, as most readily cured, are rheumatism, gout, pleurisy, inflammation, spasmodic affections and most topical complaints. The patients were alleged to be cured by drawing these tractors over the parts affected, or contiguous thereto.

A patent for "Bilious Pills" was granted in 1796, to Samuel Lee, Jr. Four additional patents were issued, for pills, to four different persons in the nineties. No copies are available. The "Federal Index of Patents, United States Patent Office 1790 to 1873," by M. D. Leggett, Commissioner of Patents, is the most complete and satisfactory, of all consulted.

The year 1836 is an outstanding one for the Patent Office, in a number of respects. A new law was passed. The numbering of patents was begun. The first numbered patent is dated, July 13, 1836. The new law had not been in operation six months when the disastrous fire, referred to above, occurred, December 15, 1836. Congress shortly thereafter made provisions to restore the records as far as possible, and to have suitable quarters built for the work. The old patents actually restored are extremely fragmentary, but they contain practically all of the available data on the subject, excepting that found in the Patent Indexes referred to above.

During the period from 1790 to the new order of things in 1836, about seventy-five patents were granted covering Pills, Medicines, Ointments and Salves. This means less than two patents a year, but the majority were issued during the last half of the period. Most of the drugs were listed simply as medicines, but a fair proportion are more definitely characterized, as is indicated by the following:

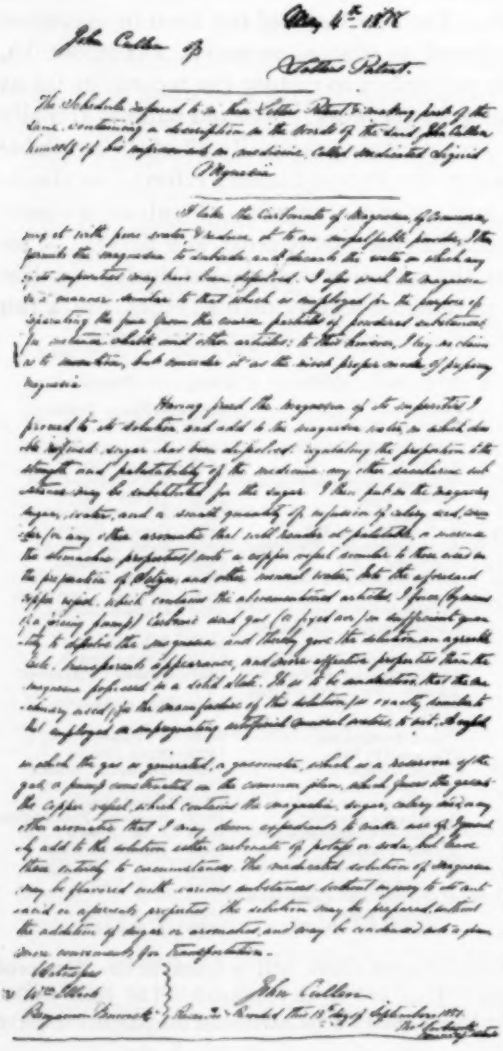
Name of Medicine.	Date.	Patentee.
Removing Pain, Etc., by Metallic Points	1796	Elisha Perkins
Bilious Pills	1796	Samuel Lee, Jr.
Antibilious Pills	1797	Benjamin Duval
Pills	1798	Samuel Cooley
Pills	1799	John Hawkes
Bilious Pills	1799	Samuel H. P. Lee
Bitters, Jaundice	1801	J. Wheaton
Antibilious Pills	1802	Thomas H. Rauson
Antibilious Cordial	1802	Simon Lazarus
Vegetable Elixir	1803	Samuel Cooley
Antibilious Pills	1803	Thomas H. Rauson
Family Pills	1803	Daniel Coit
Antiseptic Gas	1803	J. C. M. Picornell
Canker Drops	1804	S. Chamberlaine
Bilious Cordial	1804	S. Chamberlaine
Rheumatic Pills	1805	George B. Dexter
Essence of Tansey	1806	I. Newton
Vermifuge Preparation	1807	Jos. Lehman
Galvanism for Salivation	1807	William Phoebus
Cure for a Mad Dog Bite	1809	W. Story
Medicine for Scrofula and Cancer	1810	E. Willard
Bilious Pills	1810	Samuel Lee
Consumption Medicine	1812	C. S. Long
Febrifuge	1812	A. Johnson
Restorative Elixir	1812	Harvey Frink
Fever Medicine	1813	S. Thompson
Bilious Pills	1814	Samuel H. P. Lee
Rheumatic Pills	1814	Ezra Deane
Canker Drops Medicine	1814	David Halbreck
Cancer Medicine	1816	J. Andrus
Syphilis Cure	1816	J. Mosher
Syphilis Cure	1816	C. T. Jackson
Ointment	1816	William Judkins
Medicine for Toothache	1817	J. Utley
Antibilious Medicine	1817	J. J. Girard
Elixir of Life	1817	Jules Rucco
*Liquid Magnesia Process	1818	J. Cullen
Family Pills	1820	David Coit
Medicine	1820	Lorenzo Dow
Anti-dyspeptic Pills	1821	George Smith
Anti-dysenteric Medicine	1821	John G. Vought
Medicine	1822	John Prentiss
Anti-dyspeptic Pills	1822	C. M. Brockway
Medicine	1823	Samuel Thompson
Medicine for Scrofula	1824	Gideon Jaques
Consumption Pharmaceutic	1825	John C. Bay
Tincture for Curing Corns	1826	Elisha Smith
Composition for Scurvy	1827	James U. Armour
Liquid for Preventing Scurvy	1827	W. Armore
Medicine for Dysentery and Dyspepsia	1828	T. Powell
Rheumatic Pills	1828	Ezre Deane
Cough Drops	1828	Daniel E. Smith
Medicine	1828	Fitzgerald Bird
Medicine	1828	John Dent
Toothache Specific	1829	Samuel Pennington
Chemical Catholicon	1830	I. W. Smith
Blister Plaster	1830	Elisha Perkins
Medicine for Dropsy and Epilepsy	1831	J. S. Fall
Medicine for Gout and Rheumatism	1831	A. Parker
Medicine for Cholera	1832	J. Houck

* A copy each of the patents for the medicines starred above, will be found in the "Restored Patent" volumes, in the Patent Office Library. They are all in longhand. The John Cullen process patent, for "Liquid Magnesia," granted May 4, 1818, is the earliest of the patents restored for medicines.

Name of Medicine.	Date.	Patentee.
*Daphoretic or Sweating Powder	1832	H. Howard
*Bitter Tonic also an Astringent Tonic	1832	H. Howard
*Antispasmodic Tincture	1832	H. Howard
Worm Specific	1833	Charles McLane
Cure for Cholera	1833	Anthony Hunn
*Chlorine Cosmetic	1833	D. West
*Galvanic Fluid for Curing Disease	1834	Daniel Harrington
Vegetable Dentifrice	1834	Elijah H. Reid
*Ointment for Curing Many External Diseases	1835	W. W. Gray
*Ointment for the Cure of Cancer	1836	E. Gilman
*Botanic Medicines	1836	Samuel Thomas

It may be of interest to note that the Cullen patent probably contains the first process patent issued by the United States Patent Office for a medicine, that the resulting liquid magnesia resembles in a number of particulars our present solution of magnesium citrate and that magnesium compounds were recognized as possessing aperient properties over one hundred years ago and continues so to date.

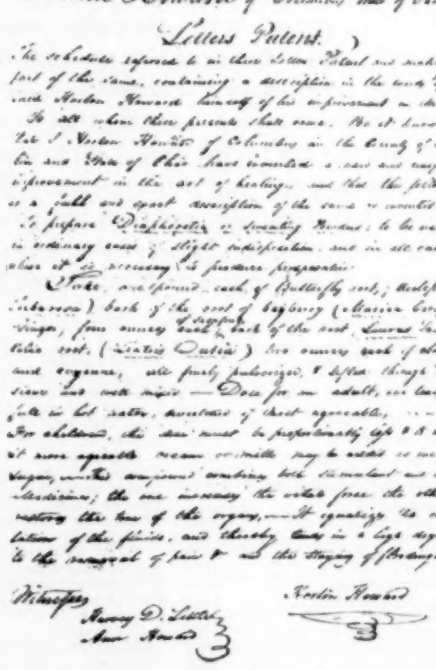
The next restored patents were granted to H. Howard, August 25, 1832. There are five of them, the names of which are given above. Submitted herewith is a photostat copy of his "Diaphoretic or Sweating Powder" patent. It reads:



Aug 25. 1832

Norton Howard of Columbus State of Ohio

Letters Patent.



A summary of the other Howard Patents follows:

Bitter Tonic (*Howard*) used in all cases where it is indicated. A powder consisting of poplar bark, roots of goldenseal, columbo and bayberry, capsicum, cloves and sugar. There is certainly nothing new and novel in this mixture to warrant giving a patent.

Tincture of Myrrh Compound (*Howard*) prepared from a mixture of powdered myrrh, capsicum, balsam of fir, and nutmeg, digested in

March 31, 1836

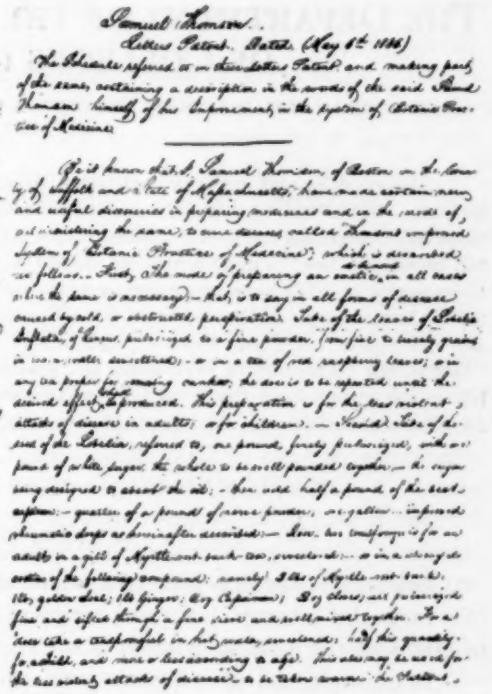
Elias Gilman

The Schedule referred to in these Letters Patent and making part of the same, containing a description in the words of the said Elias Gilman himself of his improvement in "an ointment for the cure of cancer"

To all to whom these presents shall come: Be it known that I Elias Gilman in the County of Licking and State of Ohio have invented a new and useful improvement, my ointment for the cure of the cancer and that the following is a full and exact description of the composition as invented by me. Take of sulphate of iron finely pulverized and mutton tallow equal parts, mix by thoroughly grinding or working them together so as to form an ointment or plaster. When of using spread a necessary portion of the ointment on a piece of linen, and renew it as usually may require. the cancer to be washed clean every time the plaster is renewed, alternately with a decoction of spikenard and tetters orge. and apply a small quantity of strong decoction of yellow oak bark, every time a plaster is put on. Also a solution of one part potash, add four parts water, may be used as usually may require.

Witnesses
A. P. Richard
Wm. H. Root

Elias Gilman



Samuel Thomson.
Letters Patent. Patted. (May 6th 1836)

The Schedule referred to in these Letters Patent and making part of the same, containing a description in the words of the said Samuel Thomson himself of his improvement in the system of Botanic Practice of Medicine.

Be it known that I, Samuel Thomson, of Boston in the County of Suffolk and State of Massachusetts, have made an certain new and useful discovries in preparing medicines and in the mode of administering the same, to which discovries I have given the name of "Thomson's improved system of Botanic Practice of Medicine" which is described as follows. First, the mode of preparing an emetic, in all cases where the same is necessary — that is to say in all forms of disease caused by cold, or obstructed perspiration. Take of the leaves of Lobelia Inflata, of leaves pulverized to a fine powder, from five to twenty grains in warm water sweetened; — or in a tea of red raspberry leaves; or in any tea proper for causing vomit, the dose is to be repeated until the desired effect is produced. This preparation is for the use not of children of disease in adults; as for children. — Second Take of the seed of the Lobelia, reduced to, as powder, finely pulverized, with one pound of white sugar, the whole to be well pounded together — the sugar being designed to absorb the oil; — then add half a pound of the best capsicum; — quarter of a pound of ginger powder, one gallon of imperial rheumatic drops as hereinafter described — Now, the composition is for an adult in a gill of Applebrandy each one, mixed and — or in a strong tea of the following compound; namely 3 lbs of Myrtle root bark, 1lb, golden seal; 1lb ginger; 1oz Capsicum; 3oz cloves; all pulverized fine and sifted through a fine sieve and well mixed together. For a dose take a teaspoonful in hot water, sweetened, half the quantity for a child, and more or less according to age. This also may be used for the two mildy attacks of disease, as is taken above. In Cholera,

brandy, exposed to the sun for ten days with frequent shaking. A powerful antiseptic, used internally in case of worms, pain, stomach colic, headache and all cases of internal mortification.

Anti-spasmodic tincture (*Howard*), a brandy or alcoholic solution of lobelia seed, cayenne tincture and nervine tincture; the formula of the latter is given in the patent. Used in cases of fits, spasms and poisonings.

Astringent tincture (*Howard*) used in all cases of diarrhœa, hemorrhage, cankers, ulcers and fever. *Nothing new or wonderful in any of the Howard drugs.*

Chlorine Cosmetic, in 1833.—Chlorine is combined with oils, resins, gums and fats in several ways. By mixing or grinding together, with water, chloride of lime or chlorinated soda or water impregnated with chlorine gas, to form a soft ointment or cosmetic. Remove the water by letting it settle. Flavor with bergamot or any other desired perfume.

"The object of the composition is to heal or cure teters, sores, pimple face, itch, salt rheum and cutaneous diseases of every description, either on man or beast." In one formula silver nitrate is added to give the composition additional curative properties.

Ointment for Curing Many External Diseases, 1835.—The patent embodies a method for making the ointment consisting of cottonseed-oil, linseed oil, sweet oil, Canada balsam or oil of fir, mutton suet, beeswax and lead acetate. The ointment is to be applied as often and as regularly as the case demands. The ailments enumerated are white swelling, ulcers of long standing, tumors, eruptions, burns, scalds, glandular swelling, pleurisy, rheumatism, cramp, colic, pain, soreness of the breast, dog bite, snake bite and man bite. In case of snake bite the instructions are to first scarify the bitten part.

Extreme liberality was certainly exercised in the granting of this patent, but such was the practice in the early days of the Patent Office. Ointment for the Cure of Cancer, March 31, 1836.—The patent is submitted herein:

This patent certainly does not embody anything to commend it. The ointment is crude and possesses little virtue. The use of tanner's ooze and a decoction of yellow oak bark with an iron bearing ointment is interesting. The application of a 20 per cent solution of potash to an open wound would certainly bring anything but comfort to a suffering patient.

"Thomson's Improved System of Botanic Practice of Medicine," May 6, 1836.—The patent as written up in the "Restored Patents" volumes covers nearly four pages of foolscap paper, in excellent longhand. It is the last of the unnumbered patents granted for medicines by the United States Patent Office.

Photostat copy of first page herewith. It gives a good picture of the system and the drugs used. The other three pages are of a similar purport and character.

THE DEPARTMENT OF THE AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

C. B. JORDAN—CHAIRMAN OF EXECUTIVE COMMITTEE, A. A. C. P., EDITOR OF THIS DEPARTMENT.

Food, drug and cosmetic legislation seems to be at a standstill at the time this note is written. Our efforts to secure the needed provision to protect the consumer under present conditions have been blocked by interested parties whose activity would be curtailed if the proposed bill becomes a law. Public sentiment should be aroused to the point where Congress will have to recognize it. We have no objection whatever to a revision of S. B. 5 provided the revision is for the best interests of the consumer and also reasonable from the standpoint of the manufacturer and distributor. We are, however, opposed to revisions that will nullify the bill. Ralph W. Clark of the University of Wisconsin, along with many others, has been active in bringing this bill to the attention of the retail pharmacists and the public. The following radio address by Dr. Clark is a sane presentation of the situation.—C. B. JORDAN, *Editor*.

NATIONAL FOOD AND DRUG LEGISLATION.*

BY RALPH W. CLARK.**

Our social order has entered a period of accelerating change. Notwithstanding this fact, the attempt last year represents the first far-reaching effort since 1906 to augment the legal safeguards of the consumers of foods, drugs and cosmetics.

In a simple agricultural society the problem of the supply of these commodities devolves, more or less, upon every family. In the present industrial society a large proportion of the population is entirely dependent upon the general market. There is, therefore, a need for more stringent regulation of foods and drugs and the inclusion of cosmetics and advertising which are not mentioned in the 1906 Food and Drugs Act.

The first step in food and drug legislation was taken in 1850 when a law was passed which classified various kinds of tea. One year later the AMERICAN PHARMACEUTICAL ASSOCIATION was organized "to improve and regulate the drug market by preventing the importation of inferior, adulterated and deteriorated drugs and by detecting and exposing home adulterations." This organization, as well as the American Association of Colleges of Pharmacy, the National Association of Boards of Pharmacy, the National Association of Retail Druggists, and the Wisconsin Pharmaceutical Association, favors the present bill, the essential points of which will be outlined shortly. Last year, due to a misunderstanding, pharmacists were classed as opponents to the bill. They did oppose some portions of it which they thought were unreasonable and which have since been modified. They favor the present legislation as they have in the past favored desirable legislation which had to do with public health.

From 1879 to 1906, when the present Food and Drugs Act was passed, 190 measures were presented in Congress which were designed in some way to protect the consumer. Very little active interest in favor of such legislation as well as powerful opposition thereto resulted in only eight of these measures becoming laws.

* Radio Station WHA, Home-Maker's Hour—May 15, 1935.

** Instructor in Pharmacy, University of Wisconsin; Chairman, Inter-Professional Relationship Committee, Wisconsin Pharmaceutical Association.

When the fight, just before 1906, was at its height, the name of Dr. Harvey W. Wiley was associated with various newspapers and magazines in exposing many existing evils and urging legislation to correct them. How different is the situation now when newspapers, magazines and radio are not favoring, but in many cases opposing this legislation, at least by not bringing information on it before the public. It is encouraging to have read early this year in the *Nation* and the *Milwaukee Journal* comments favorable to the proposed legislation. *Time*, however, recently made somewhat of a joke over the fact that the present Copeland Bill had been indefinitely postponed.

Credit should be given to the book, "100,000,000 Guinea Pigs," for stirring up an interest in the need for this type of legislation. Its authors, however, in writing the book, a best-seller a year or two ago, and in operating Consumer's Research, are no less financially interested than manufacturers of foods, drugs and cosmetics. Many of the statements made are radical to say the least and should not influence the consumer too much. After all, it is home operation of an electric refrigerator or car and not laboratory tests that decides the value of the product. Certainly most manufacturers, the ones who intend to stay in business, undertake to market a product only after assuming the responsibility that their product is of high enough quality to be safe for consumer use and will be what they claim it to be when the consumer uses it for the purpose for which it is intended.

For the past few years, however, there has been a rapidly growing public recognition of the need for a revision of the Law of 1906 to better control the unscrupulous manufacturer. Court decisions have revealed weaknesses in the measure that were not foreseen when it was enacted, yet few substantial alterations of the existing Law have been made. In June 1933, Senator Copeland introduced a bill, S. 1944, known as the Tugwell Bill, intended to strengthen and extend the Federal Food and Drugs Act of 1906. A storm of protest arose against the bill and it was twice revised, first as S. 2000 and later as S. 2800. Although the bill was reported favorably by a sub-committee of the Committee on Commerce, it was not acted upon in the last Congress because of the brief time between its favorable report and adjournment, because of the press of other legislative matters and because the revisions had not served to allay powerful opposition from some elements of the regulated industries.

Since the last session of Congress Senator Copeland has spent much time in revising and perfecting the measure which was introduced into this session as S. 5 and is now popularly called the Copeland Bill. Following hearings held in March 1935, the bill was again favorably reported to the Senate. The provisions which aroused most opposition have been rejected. Chief among them was the one giving the Secretary of Agriculture extensive power in rule-making. The Secretary must, in the revision, which at the moment has been indefinitely postponed, consult the proper advisory committee, one on Food and one on Public Health, to be appointed by the President, and have its majority vote before establishing any regulations for the enforcement of the Act.

The bill now contains the valuable features of the present law. Its principal differences from the present law lie in the elimination of those provisions whose terms have caused courts to make interpretations that have afforded avenues for escape for the unscrupulous; extension of its provisions to cosmetics and advertis-

ing; amplification and reinforcement of certain provisions to safeguard public health and to promote honesty and fair dealing; and to strengthen its procedural provisions better to effectuate its purpose.

The Copeland Bill contains definitions of foods, drugs and cosmetics which are broad. There has been no difficulty experienced with the definition of a food, but the term drug has now been made broad enough to include mechanical devices; while the definition of the term cosmetic is inclusive enough to embrace all substances, other than ordinary toilet or household soap, intended for cleansing or altering the appearance of, or promoting the attractiveness of the person. The bill prohibits labeling of foods, drugs and cosmetics in any manner which is false or misleading in any particular and every label must bear the name and place of business of the manufacturer. The latter inclusion is intended to prevent the sale of commodities under labels which remain silent with respect to the sponsorship of the products, or which utilize merely fictitious names, and to establish responsibility for statements used in advertising. The language of the bill is designed to prevent the use of claims of misleading breadth and to require, in the case of drugs, that all representation be limited to the actual value of the drug. In general, misbranding is designed to apply to all misrepresentation of whatever kind, whether of origin, identity, quality, effect or other description of property.

The definitions of standards in the bill are broad and delegation of power to make further regulations such as may become necessary are provided for in the manner previously mentioned. Adulterated is the term applied to products to which substances have been added which are in themselves harmful. An adulterated food, drug or cosmetic is, therefore, one which contains a substance which may render it dangerous to health under the conditions prescribed for its use. Certain color and other tolerances are set up and still others may be promulgated by the Secretary with the approval of the proper advisory committee.

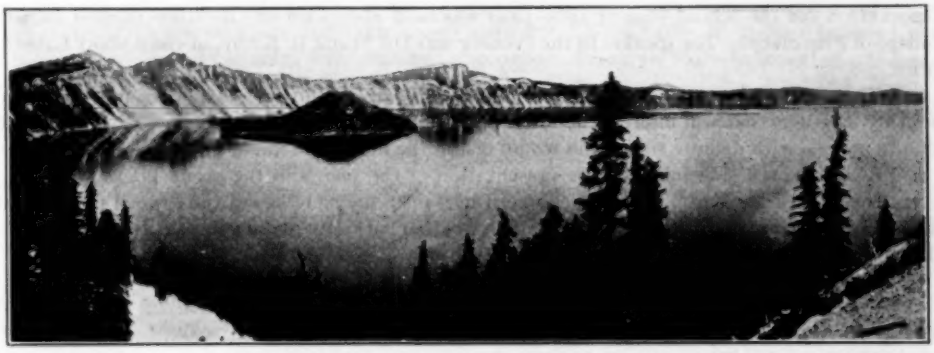
Advertising, as you all know from seeing and hearing it, needs considerable attention. Much of it is based upon the motive of fear—fear that one will lose his position unless he sleeps on a certain kind of mattress or drinks a certain kind of coffee; fear that he will be ostracized from society if certain mouth washes are not used to purify his breath; fear that a child will not be well if he is not given certain beverages and food—all these and many more call to mind specific advertising seen and heard regularly. This sort of thing I hope and believe will be cleared up if the Copeland Bill becomes a law. It should be remembered, too, that half-truths are more pernicious than falsehoods. The bill requires that statements used on the package, in the newspaper, in the magazine, and on the radio, must be statements of fact when the product is used as specified. If, for instance, the word antiseptic is used in describing a product, it must meet the test required in the bill for an antiseptic under the conditions indicated.

I have two small children at home. It is irritating to me to read or hear advertising stating that I am experimenting with them unless I use certain products for appetite-stimulators or for the treatment of colds and other so-called minor ills. I know full well that I really am experimenting unless they are seen regularly, whether sick or well, by a physician who has the training, the experience and the apparatus to check up on their general condition, and, in the case of colds, to listen to their lungs and inspect their ears and throats.

It should be pointed out that the manufacturer who is interested is treated fairly in that he may ask and receive a court review of the regulations handed down by the Secretary of the Department of Agriculture. The Act, by the way, should be administered in this department, rather than by the Federal Trade Commission, as proposed in certain other bills on this subject before this session of Congress. The Federal Trade Commission is regularly occupied in issuing cease and desist orders for unfair trade practices and not in deciding what products are good for the public health.

In conclusion let me quote from *The Milwaukee Journal* editorial: "In general the Copeland Bill is right, and it would result in more effective protection to the public than does the present law." It is therefore necessary for you home-makers to take an active interest in securing the passage of the Copeland Bill. As I have said before, this bill[1] has now been indefinitely postponed but may be brought up again at any time. The present attempt is in danger of again not becoming a law and the much-needed legislation will be successful only if sufficient consumer interest can be aroused.

[1] The Copeland Bill (Federal Food, Drugs and Cosmetic Act) was passed by Senate, May 28, 1935, and referred to Interstate and Foreign Commerce, May 31, 1935.



Crater Lake, in Crater Lake National Park, is known as one of the "Seven Wonders of the World."

Crater Lake, in Crater Lake National Park, is considered one of the wonders of the world. To one historically minded, Oregon has an extra charm. The winning of the Pacific Northwest—the states of Oregon, Washington, Montana, Idaho and Wyoming—is a story with Oregon its focal center. It was at Champoeg, a little spot on the Willamette 30 miles above Portland, that a provisional government of the Oregon country under the Stars and Stripes was declared on May 2, 1843. At the mouth of the Columbia River a hundred miles from Portland lies Astoria, the first settlement in Oregon, founded by John Jacob Astor in 1811, a community that fell to the British in the War of 1812 and was recovered six years later. A few miles beyond lies Seaside, where Lewis and Clark reached the end of the trail. Just across the Columbia from Portland stand Vancouver Barracks, where General Grant and others of his day served as lieutenants and captains. Monuments, statues and shrines mark these places.

The world-famed Columbia River Highway starts eastward through the wondrous gorge of the Columbia from the very edge of Portland. An hour's drive carries you to some of the greatest scenic spots on this magnificent drive: to the Vista House perched on the top of a mighty cliff some 700 feet straight above the great river where you may look out over a vast stretch of Oregon and of Washington lying just across the stream; to Multnomah Falls leaping down a sheer 625 feet in a roaring, mystic white. Words are futile in describing the magnificence, the awe-inspiring grandeur of this highway hewn out of the towering rock-walled gorge which the river cut through the Cascade mountain in endless centuries of toil.

PROCEEDINGS OF THE LOCAL BRANCHES

"All papers presented to the Association and Branches shall become the property of the Association with the understanding that they are not to be published in any other publication prior to their publication in those of the Association, except with the consent of the Council." —Part of Chapter VI, Article VI of the By-Laws.

ARTICLE III of Chapter VII reads: "The objects and aims of local branches of this Association shall be the same as set forth in ARTICLE I of the Constitution of this body, *and the acts of local branches shall in no way commit or bind this Association, and can only serve as recommendations to it.* And no local branch shall enact any article of Constitution or By-Law to conflict with the Constitution or By-Laws of this Association."

ARTICLE IV of Chapter VII reads: "Each local branch having not less than 50 dues-paid members of the Association, holding not less than six meetings annually with an attendance of not less than 9 members at each meeting, and the proceedings of which shall have been submitted to the JOURNAL for publication, may elect one representative to the House of Delegates."

Reports of the meeting of the Local Branches shall be mailed to the Editor on the day following the meeting, if possible. Minutes should be typewritten with wide spaces between the lines. Care should be taken to give proper names correctly and manuscript should be signed by the reporter.

CHICAGO.

The last monthly meeting of the Chicago Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION for the school year of 1934–1935 was held May 14th at the University of Illinois College of Pharmacy. The speaker of the evening was Dr. Frank B. Kirby, of the Abbott Laboratories.

The "Kirby Group Plan" was presented by President Webster. The plan has as its aim monthly meetings that will interest the retail druggists. The meeting time would be divided into definite periods with definite topics and would last in the neighborhood of two and one-half hours.

A lively discussion followed the presentation of the plan and the group present voted to accept the offer of Dr. Kirby to send a copy of the plan to the members of the Branch so as to get the opinions of those interested in the plan as to whether such an organization should be started in Chicago.

Dr. Kirby was presented, and discussed "Diseases of the Head."

The discussion was divided into three subdivisions, namely, (1) The Eye, (2) The Nose and (3) Hay Fever.

The Eye.—Dr. Kirby stated that the pharmacist should be in a position to render the eye specialist some kind of special service. As a suggestion, the stock in the store pertaining to eye medication could be arranged in special shelving. Then the druggist could pose as catering to this special field. The necessary equipment should be obtained to properly fill this type of prescription and signs should be displayed giving the impression that you are paying particular attention to the filling of prescriptions involving the eye.

You are now in a position to make a personal call on the eye specialists. It was suggested that at least six specialists and a population of 200,000 is needed before a special department should be established.

Twenty of these departments have been established in stores through the help of Dr. Kirby.

The Nose.—Dr. Kirby made a plea for professional recognition of colds in the head. Large companies have been making intensive surveys of the loss of time by employees due to colds in the head. No one has come along with a specific for colds in the head.

It was suggested that a professional window, depicting that the physician can render aid where common remedies fail, be displayed. Part of the window space can call attention to bacterins. These are injected by the physician but indirectly create good-will with that profession. A minor part of the display can be devoted to vitamin A, making mention of the reasons why it should be taken during the seasons when colds are easily acquired.

Hay Fever.—Two million people suffer annually from hay fever in this country.

Two opportunities await those dispensing hay fever medicines. *First*, there is the pre-

ventive medicine that is appreciated by the sufferers and one may start treatment prior to August 15th, say about the middle of June.

In many cases known sufferers may go through the entire season with relief if they take injections of the correct pollen extract before the air becomes contaminated with it.

About 10% of the suffering comes from hay, mainly timothy, and sometimes blue grass. About August 15th, the chief offender, the ragweed, comes along.

A suggestion was made that a ragweed be placed in the window as very few people know what it looks like. Show how pollens are marketed, the syringes, and a chart showing the pollen content of your territory. These charts are easily obtained.

Such a window was placed in a Chicago loop drug store and attracted so much attention that it was left in for a much longer period of time than had originally been planned.

During the first part of August a curative window should be displayed. There will now be new victims and those sufferers who did not take the June treatment. The display will be of a remedial nature and should show sprays, nasal douches, ephedrine preparations, eye preparations and vitamin A products. A full grown ragweed could be shown with blue glazed glass or blue glazed paper below which will show the pollen as it falls from the plant. These windows are known to have given results according to Dr. Kirby. The meeting was closed with an open discussion and with a rising vote of thanks to Dr. Kirby for his interesting discussion.

LAWRENCE TEMPLETON, *Secretary.*

NEW YORK.

The May 1935 meeting of the New York Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION was held on May 13th, in the College of Pharmacy of Columbia University, New York. About thirty members and their guests attended. Dr. Charles W. Ballard presided, the minutes of the previous meeting were read and approved. Treasurer Currens reported a balance on hand.

Chairman Lehman of the Committee on Education and Legislation then reported as follows:

"Fair Trade Stabilization has lost a valuable friend and ally in the accidental death of Clyde Kelly, former congressman from Pennsylvania.

"The Copeland Food and Drug Bill S. 5. It will be several weeks before this measure may come up. Rumor has it that a compromise has been effected and that the bill will come up in an amended form.

"American Retail Federation: Recent press release announces the formation of this super-trade organization, which is supposed to represent over one million retailers in the United States; the Executive Committee of the organization consists of:

"Louis Kirstein, Department store operator in Boston; George M. Gales, of Liggett & Co.; C. W. Kress, Five and Ten Cent Stores; F. Lazarus, Jr., department store operator in Columbus, Ohio; A. H. Morrill, of the Kroger Grocery & Bakery Chain; Samuel Robinson, of American Stores; Lessing Rosenwald, of Sears, Roebuck & Co.; E. C. Sams, of J. C. Penney Co.; H. J. Tilly of the Retailers National Council.

"General Johnson on April 18th, asked 'How much voice is the little fellow going to have in such an organization?'

"An investigation of this Retail Federation has been authorized by unanimous vote of the House of Representatives and is being conducted under the chairmanship of Congressman Cochran of Missouri and six other members, including Congressman Cole of New York. Pharmacists and others are asked to write to the chairman of the Committee stressing the need of statutory protection by small business men against monopolistic tendencies in distribution.

"The New York State Prophylactic Bill (Stewart Bill) was signed by Governor Lehman, on May 9th, and is now a law.

"The Fair Trade Bill was passed by the Senate some time ago, and during the last days of the Legislative session by an enormous majority in the Assembly, but so far has not been signed by the Governor.

"An organization favoring Price Stabilization of Trade Marked merchandise is the 'Allied Retailers Association' consisting of:

"The New York State Pharmaceutical Association, The New York State Retail Food Merchants, The New York State Retail Meat Dealers, The New York State Retail Jewelers, The New

York State Retail Liquor Package Dealers, The Paint Dealers Protective Association, the Retail Dealers of America, representing 174,000 retail outlets in the State of New York.

"A meeting of this organization will be held at the Hotel Pennsylvania in the interest of the adoption of the Feld-Crawford Fair Trade Bill, on the date of Wednesday evening, May 15th. Every local organization affiliated with the N. Y. Pharmaceutical Association is entitled to one official delegate to this meeting.

"From Bruce Philips Bulletin we see that the 'Medical Society of Greater New York (?)' is seriously discussing the question of a standardized home and office visit charge by the physician to the needy in that section. Suggested fees to be $1.00 for office and $2.00 for house visits.

"It is suggested that physicians at the same time should consider economies in the matter of prescription writing, and call for U. S. P. and N. F. Remedies, instead of expensive proprietaries.

"The New Booklet of the U. S. P. and N. F. Propaganda Committee of the New York State Pharmaceutical Association, under the chairmanship of our member J. Leon Lascoff, is now ready for distribution. The book contains information for the physician about official preparations, their strength, dosage and therapeutic value: also a large number of suggested prescriptions. 50+ pages; price 25¢ per copy.

"Alcohol regulations permitting the sale at wholesale of alcohol in containers of two or more gallons have gone into effect. Those pharmacists in N. Y. State who have a $1.00 license can only purchase in containers as designated.

"Seizures and dismantling of stores violating the federal alcohol laws have been moderated so as to provide a hearing for the accused before indulging in the drastic action heretofore exercised by the officials."

In view of the fact that since the meeting the NRA has been declared unconstitutional all references to NRA and code provisions have been omitted from Mr. Lehman's report.

A letter from Samuel Hilton, Remington Medalist for 1935, was read. This letter brought on a discussion concerning the actual presentation of the medal. In this discussion Dr. Schaefer, Mr. Currens and Dr. Newcomb took part. It was finally moved and approved that the secretary and the Executive Committee would be empowered to arrange for the presentation either in Washington or in New York City, according to Dr. Hilton's wishes. In the event that the presentation would take place in New York City the program would be patterned after the procedure followed at the time of the Remington Medal presentation to Dr. E. F. Kelly.

President Ballard appointed Samuel C. Henry and Mr. Fred C. A. Schaefer to act as Branch delegates at Delegates' meetings of the New York Pharmaceutical Council. Professor Otto Canis, of Fordham University, and Mr. Jacob Seley were appointed to act as alternates. In connection with this Dr. Schaefer suggested that the report of the Council Delegates be made a regular part of the Branch meeting program from now on.

Dr. Ballard then introduced the speaker for the evening, Dr. Robert P. Fischelis, president of the AMERICAN PHARMACEUTICAL ASSOCIATION, whose address was entitled "The A. PH. A.—Shall It Remain a Symbol or Shall It Become a Living Thing?"

Dr. Fischelis began his address by pointing out that for nearly eighty-three years the pharmacists of the United States have looked up to the A. PH. A. as the personification of everything they would like pharmacy to represent in the highest and most professional sense. In spite of this the membership represents less than three per cent of the pharmacists of the United States. He emphasized the fact that the ASSOCIATION remains something distant and hazy in the minds of most pharmacists from a strictly practical sense.

In more recent years developments in pharmacy have forced pharmacists to consider relations and to question all things and have focused attention upon the men and things responsible for the conditions which surround every phase of our profession and industry. In attacking these various problems they have evolved new units in American pharmacy to grapple with the various problems. In the meantime the A. PH. A. instead of making use of its power to assist in the evolution of American pharmacy has calmly sat by and permitted new organizations to come into being. In this sense it has completely failed to assume the responsibilities which it justly should have and has even encouraged and fostered the growth of new organizations to handle specific problems. It is the argument of Dr. Fischelis that this is a great pity, for it has permitted a decentralization of power in American pharmacy with various groups pulling in different directions.

He pointed out particularly that the original organization as set-up of the A. PH. A. was

such that no changes would be necessary in order to assume the various responsibilities, both professional and economic, which confront the industry. It is his opinion that in their conservatism the leaders of the ASSOCIATION have leaned over backwards.

In calling attention to some of the problems which the ASSOCIATION should rightfully have handled, Dr. Fischelis cited that in many instances the good name and prestige of the A. PH. A. had been used by numerous organizations as a means of furthering their program and gaining wider recognition. He stated that every single one of these organizations which has endeavored to capitalize on the prestige of the A. PH. A. always has capitalized on objectives, to which the A. PH. A. could have and should have directed its attention, if it had been a living thing and not merely a symbol.

In criticizing the ASSOCIATION for failure to assume its rightful place in American pharmacy, Dr. Fischelis stated that both inertia and the force of reactionary elements within the ASSOCIATION were responsible for the inactivity.

Before proposing a remedy the speaker carefully explained the present set-up of the ASSOCIATION and pointed out how provision was actually already there for assuming leadership in both the professional and economic fields of the industry. He went on to explain how a closer tie-up could be arranged between the State Association, the A. PH. A., the N. A. R. D. and the local A. PH. A. Branches which would make it possible for a single membership fee to provide adequate revenue for these various units. With such a set-up organizations like the Drug Institute would be wholly superfluous and it was Dr. Fischelis' opinion that if the large sum of money collected on behalf of that organization had been poured into such a set-up it would have been more productive of results since no salaries up to twenty-five thousand dollars a year would need to be paid.

In closing, Dr. Fischelis called attention to the power and unity represented in the medical field by the American Medical Association and the influence which this organization wields over advertising in the pharmaceutical field as well as physicians.

In the discussion which followed, A. W. Pauley of the Drug Center of St. Louis stated that he believed that the Drug Institute filled a place which other organizations could not. He claimed that individual associations had their own responsibilities and that the present set-up might better continue. He was particularly interested in calling attention to the Retail Federation which he claimed could easily destroy the independent retail druggist and called upon every retail unit to fight this new movement.

C. V. Michaels, of the Drug Institute, very briefly called attention to some of the work being done by the Institute and pointed out that this body had contributed something in awakening other organizations to their respective responsibilities.

Secretary Newcomb, of the New York Wholesale Druggists Association, believed that a furthering of the activities of the AMERICAN PHARMACEUTICAL ASSOCIATION would weaken the professional standing of that organization. He pointed out that in reality, two kinds of drug stores were making their appearance, one a strictly professional and ethical prescription pharmacy and the other a miniature department store. He believed that the AMERICAN PHARMACEUTICAL ASSOCIATION would best fill its place in American pharmacy by retaining its active interest in the professional and scientific side and not by entering into the business field.

President David I. Cohen, of the New Jersey State Pharmaceutical Association, claimed that more active workers were needed in the field and that the industry required consolidating of its various forces.

Dean H. V. Arny pointed out that the AMERICAN PHARMACEUTICAL ASSOCIATION was an extremely conservative pharmacy organization and had in more recent times broadened its interests. He also stated that the House of Delegates had failed to fully function. Referring to Dr. Fischelis' statements concerning the solidarity shown in other professional fields it was Dr. Arny's opinion that this was not exactly true, and that the solidarity was not as great by any means as it appeared to be on the surface.

At the close of the discussion, a rising vote of thanks was accorded the speaker and all those who took part in the discussion.

RUDOLF O. HAUCK, *Secretary.*

PHILADELPHIA.

The May meeting of the Philadelphia Branch, AMERICAN PHARMACEUTICAL ASSOCIATION was held May 21, 1935, at the Philadelphia College of Pharmacy and Science, President E. H. MacLaughlin in the chair.

The speaker of the evening, Dr. Robert P. Fischelis, president of the AMERICAN PHARMACEUTICAL ASSOCIATION, spoke on "The AMERICAN PHARMACEUTICAL ASSOCIATION and the Future of American Pharmacy." Dr. Fischelis's speech was one of the most interesting heard during the past year. He emphasized the pitfalls of American pharmacy and the need of wholehearted coöperation on the part of pharmacists throughout the United States, if they hoped to survive the great wave of influence which is tending to degrade pharmacy and to eliminate the individual pharmacist.

He stressed the importance of the organization of pharmacists into one powerful cohesive group, pointing out that the AMERICAN PHARMACEUTICAL ASSOCIATION, with its present set-up, was able to cope with any major Pharmaceutical problem. He emphasized the need of a new type A. PH. A. JOURNAL—one that would hold interest and be helpful for the pharmacist as well as the scientist.

A rising vote of thanks was given Dr. Fischelis in appreciation of his most valuable talk.

Respectfully submitted,

GEORGE E. BYERS, *Secretary.*

(*Concluded on page 521.*)

A PHARMACEUTICAL STUDY OF p_H.

BY FREDERICK F. JOHNSON.

(*Concluded from page 412, May Journal, A. Ph. A.*)

p_H AND STABILITY OF GALENICAL PREPARATIONS.

Digitalis Preparations.—The question of p_H and digitalis stability has been a matter of controversy for many years and is far from settled at the present time. Hintzelmann and Joachimoglu (89) stated that the tincture was most stable in an acid medium. Emig (238) reported that tinctures prepared from menstruums of p_H 4.5–5.2 showed the least loss in potency although the initial potency was less than for normal tinctures. Rowe and Scoville (248) stated that adjustment of the tinctures to p_H 4.0 with hydrochloric acid increased the stability and later stated (289) that tinctures of p_H 3.0 were more stable than those of p_H 6.0 or 7.0.

In contrast to these results, Haag and Hatcher (127) reported that HCl decomposed constituents of digitalis, Wokes (187) reported that acidifying did not increase stability, Haag and Jarrett (206) reported that no definite relation existed between the activity of the tinctures and p_H, and Foster and Van Dyke (264) stated that the most stable tinctures were those of highest p_H.

Hintzelmann and Joachimoglu (83), (42) reported that alkalinizing the tinctures with $NaHCO_3$ greatly increased deterioration, while Wokes (187) reported that the addition of Na_2CO_3 caused very little deterioration. Joachimoglu and Bose (65) reported that the addition of tartaric acid increased the stability. Rowe and Scoville (248) reported that the addition of hypophosphorous acid as a reducing agent was detrimental. It seems to be definite that the addition of anhydrous sodium acetate or anhydrous sodium sulphate as antihydrolytic agents does result in increased stability (248), (289), (301).

Several investigators have reported that stability is increased by destroying the ferments of the crude drug or preparations by heat (95), (248), (289). Rowe and Scoville (289) reported that tinctures prepared from a 77% alcoholic menstruum were more stable than those prepared from an 87% menstruum, but Stasiak (329) claimed that absolute alcohol tinctures were more stable than 70% alcohol tinctures. Macht and his co-workers (88), (98), (99) stated that ultraviolet light and polarized light hastened destruction of the tinctures, but Bond and Gray (108) claimed that no destruction was produced by exposure to either light.

There is plenty of evidence that the crude drug, tincture and infusion tend to become more acid during storage (92), (162), (214). Krantz (163), (274) has determined the buffer capacity of the tincture as 0.009 between p_H 5.75–2.50, and as 0.012 between p_H 5.75–9.50, 5.75 being the p_H of a U. S. P. tincture. He further stated (243) that the acids of the leaf are probably combined

with potassium and are extracted by the alcohol-water mixture yielding a system having a high buffer capacity, consisting of a strong base combined with a weak acid, and also some slightly dissociated acid.

Carr and Krantz (308), while investigating for the Revision Committee of the U. S. P. XI, arrived at the following conclusions concerning the tincture of digitalis: The official tincture has a p_H of 5.50–6.00. Considering the manner of dosage, it is a stable product. There is no distinct evidence that its stability can be increased by buffering or by adding acid to the product.

Concerning infusions of digitalis, the consensus seems to be that preservative agents increase stability, that the infusions become more acid with age, and that a neutral infusion is most stable (77), (92), (214). The infusion is less acid than the tincture.

Ergot Preparations.—In 1926, an article in the *Public Health Reports* (79) stated:

> "In order to insure the stability of the liquid extract, the hydrogen-ion concentration should be adjusted within the limits represented by p_H 4.0 and p_H 5.0. The extract should be sterilized and sealed in ampules of non-alkaline resistant glass."

The p_H of the U. S. P. Fluidextract of Ergot is approximately 4.5. In the last few years there has been a great variety of opinions concerning the efficacy of further reductions of the p_H. The confusion in the literature is augmented by the undependable results of the various assay methods.

Six investigators have concluded that adjusting the p_H to about 3.0 favors stability of the fluidextract and the alkaloid solutions (138), (188), (229), (247), (288), (306). These workers disagreed, however, concerning which acid was most effective. Powell and his co-workers (247) favored tartaric acid, Rowe and Scoville (288) favored reducing acids and Bernerowna (306) claimed that phosphoric acid was best. Swanson (250) stated that a p_H of 3.0 appeared to favor stability of the fluidextract, hypodermic solutions of ergot, and alcoholic solutions of ergotamine tartrate, but that the results were very questionable and no conclusions could be drawn. Three investigators (227), (269), (294) reported that lowering the p_H either did not increase stability or resulted in even more decomposition.

Smith and Stohlman (227) reported that the addition of 2.5% sodium thiosulphate or 2.5% sodium hyposulphite or 1% cysteine hydrochloride as reducing agents to the fluidextract or alkaloid solutions favored stability if above p_H 5.0. Bartsch (191) claimed that ergotamine tartrate was most stable at p_H 2.04. Bernerowna (306) stated that of the various salts of the ergot alkaloids, the organic salts were most stable, and the sulphuric acid salts were more stable than the hydrochloric acid salts. Wokes and Elphick (188) claimed that for proper extraction of ergot, the p_H of the menstruum must be not less than 5.4.

Aconite Preparations.—The attempts to stabilize aconite preparations by adjusting the hydrogen-ion concentration have been quite successful. Swanson (64), (69), (105) performed the original work and recommended that the p_H values of the tinctures and fluidextracts be adjusted between p_H 2.5–3.00. Without addition of acid, the p_H of the U. S. P. tincture lies between 5.1–5.6. By lowering the p_H, Swanson was able to decrease the deterioration from 90% to 5%. He pointed to the discrepancies in the assay methods as deterioration increases. The chemical assay at no time showed any loss of potency; the guinea pig and white mice methods were concordant for standard preparations but the difference between the two increased as deterioration progressed.

Haag and Hawkins (155) thoroughly verified the results of Swanson. Baker (304) also agreed with Swanson and established the optimum p_H range for all aconite preparations as p_H 2.3–3.0. He recommended the use of hydrochloric acid rather than a reducing acid like hypophosphorous acid. He also reported that all of the tinctures became decidedly less acid during storage. The only disagreement to the established optimum p_H range was put forward by Munch and Pratt (282) who claimed that adjusting the p_H to 2.5–3.10 did not increase the stability of the tincture or fluidextract.

Carr and Krantz (308) recommended to the Revision Committee of the U. S. P. XI the adoption of the p_H range 2.5–3.0 for Tincture of Aconite. It was reported that if the tincture is acid to methyl orange and shows an orange color with thymol blue, it will be within the stable p_H range. Carr and Krantz reported the buffer capacity of Tincture of Aconite as 0.0086 in the acid range. This is very close to the buffer capacity of Tincture of Digitalis, which is 0.0090.

Miscellaneous Vegetable Preparations.—Krantz and Slama (97) reported that the precipitation in the Compound Tincture of Gentian could be minimized by adjusting the reaction to p_H

7.0. The official tincture has a p_H of 5.2. The precipitate was composed of starch, gentian sugars and albuminous material. Beguin (120) found that by exposing the crude gentian to hot alcohol vapors, the hydrolysis and inversion of gentian sugars and glucosides were considerably reduced.

Swanson and Hargreaves (118), (182) have studied the effect of the hydrogen-ion concentration upon veratrum, gelsemium and nux vomica preparations. The optimum p_H for both the fluidextract and the tincture of veratrum was between p_H 4.3–4.8. The p_H of the U. S. P. IX fluidextract is 5.0 and of the U. S. P. X tincture, 5.4. The N. F. Fluidextract of Gelsemium of p_H 3.45 was stable and remained so when the p_H was reduced to 1.0. The N. F. Fluidextract of Nux Vomica of p_H 5.30 was stable and remained that way when the p_H was reduced to 0.75.

Lichtin (215) reported that acidifying the menstruum or percolate of Tincture of Cinchona did not increase stability. Caines and Evers (260) have reported concerning the loss of color in mixtures containing the B. P. Compound Tincture of Cardamon. From p_H 7.0–9.5 the mixtures were stable in the dark but fading occurred in the dark at higher p_H values. Calcium salts caused precipitation of calcium carminate at p_H 4.0 and above.

Scoville (103) has studied the effect of acid upon the precipitation in many of the less important tinctures. The acid increased precipitation of red cinchona, aloe, frangula, juglans, rhubarb, senna, rhus glabra, quercus, wild cherry and stillingia. It retarded precipitation of cinchona calisaya, castanea, geranium and rose. Sodium acetate retarded precipitation of aloe, frangula, senna, chionanthus, glycyrrhiza, salix nigra and senega. It seemed that the tannin-containing drugs were especially prone to precipitation by hydrolytic action. Krantz (162) reported that Fluidextract of Cascara becomes slightly more acid upon standing and that Elixir of Iron, Quinine and Strychnine becomes much less acid upon standing, irrespective of the type of light to which they are exposed.

Turner (230) stated that the syrup and mucilage of acacia rapidly decompose because of the development of acidity. Attempts to produce acid-free preparations by heat sterilization and the use of preservatives were unsuccessful. Eschenbrenner (199) has reported that infusions of ipecac can be stabilized if prepared with dilute hydrochloric acid and 15% alcohol. This corresponds to the U. S. P. acid fluidextract. The p_H of Eschenbrenner's infusion was 4.5. Madsen (216) claimed that such an infusion was unstable and proposed a formula which produces an alcoholic infusion of p_H 3.6. This was claimed to be stable for three years.

Conduche and Gregoire (148) have reported that in aromatic waters, both filtered and unfiltered, there was a diminution of acidity on keeping. The p_H usually changed from about 3.8–7.0. The reduction of acidity was almost proportional to the amount of volatile oils which separated and was evidently a result of the removal of the volatile oils. The reaction could best be stabilized by preventing the growth of microörganisms. Krantz and Carr (164) have investigated the effects of different filtering mediums upon the reaction of Aromatic Elixir. Using talc, as in the U. S. P. preparation, the p_H values were between 7.00–7.35. Elixirs prepared with magnesium carbonate had p_H values from 9.10–9.80, with magnesite or normal magnesium carbonate the p_H was 6.8, and with precipitated calcium phosphate the p_H was between 5.95–6.30.

Miscellaneous Chemical Preparations.—Husa and Klotz (314), (315) have studied the mode of decomposition of Syrup of Ferrous Iodide. During storage the p_H always dropped from 4.1 or above to 3.2. The hydrolysis predominated according to the equation:

$$FeI_2 + H_2O \rightleftharpoons Fe(OH)I + HI.$$

Two equilibria existed in the hydrolysis: one at p_H 4.1, and the other at p_H 3.2. Precipitation occurred at p_H 3.2. Alkaline glass of the container retarded the hydrolysis. It was shown by solubility product data that precipitation of $Fe(OH)_2$ cannot occur in the syrup. Éwe (200) reported that Syrup of Hydriodic Acid caramelized, due to excessive acidity. Attempts to lower the acidity by reducing the proportion of hypophosphorous acid resulted in the appearance of free iodine in the syrup. When the acidity was reduced by diluting the syrup with water until the sugar content was 35%, the syrup remained colorless for a year. Husa and Magid (271) also reported that the decomposition of the Syrup of Hydriodic Acid increased with increasing hydrogen-ion concentration. Mercuric iodide, barium iodide, aluminum sulphate and calcium chloride caused a marked retardation of the decomposition of the syrup.

Guyote (74) reported that a solution of arsenous iodide hydrolyzes to hydriodic acid which becomes oxidized to free iodine. This was overcome by neutralizing the solution with sodium

hydroxide, thus converting the arsenous iodide to an arsenite. The arsenite solution appeared to be stable. Knight (112) criticized the U. S. P. Fowler's Solution, claiming that 2% of potassium bicarbonate causes an unnecessary increase in alkalinity. He stated that 1% of potassium bicarbonate would be sufficient. Smelt (293) recommended that the B. P. Fowler's Solution be adjusted to a p_H less than 4.0. The growth of molds was favored between p_H 5.0–7.8, and precipitation occurred between p_H 4–9. The acid solution was favored because of greater compatibility.

Donovan's Solution can be sufficiently stabilized by adjusting the p_H to neutrality. The U. S. P. preparation is very acid, due to the hydrolysis of the arsenous iodide. Cocking (122) and Husa (160) both showed that the hydrolysis of dilute arsenous iodide is complete, the p_H of tenth normal solutions of arsenous iodide and hydriodic acid being the same, 1.1. Duncan (14) first showed that the liberation of iodine from Donovan's Solution could be checked by neutralizing the free hydriodic acid. Husa (158), (241), (270) found that the p_H of Donovan's Solution was 1.2. There was no liberation of iodine when the p_H was adjusted to 6.0–8.0. He recommended the use of a carbonate as the neutralizing agent as it prevented oxidation by replacing the air with carbon dioxide.

Husa (272) stated that the stability of Solution of Iron and Ammonium Acetate was slightly increased when the acetic acid was omitted and the solution buffered with hydrochloric acid, ammonium chloride and sodium chloride. Jones and Glass (161) reported that properly prepared Iron and Ammonium Citrate is a neutral substance of p_H of about 7.5. Its incompatibility with magnesium sulphate could not be correlated with any increase of p_H. Morton (168) stated that the commercial bismuth and ammonium citrate and the B. P. Solution of Bismuth and Ammonium Citrate are unsatisfactory preparations. The complex was stable only in the presence of an excess of alkali citrate. Kleinschmidt (212) claimed that the Solution of Magnesium Citrate would not precipitate if the citric acid content were reduced. Oakley and Krantz (246), however, decided that the precipitation was due to the conversion of a large amount of the magnesium acid citrate to the neutral salt, $Mg_3(C_6H_5O_7)_2$, and that the presence of an excess of citric acid would shift the equilibrium to the acid salt and favor stability.

Éwe (200) reported that the fungous growths in the Acid Solution of Phosphates could be prevented by the addition of about 1% of concentrated hydrochloric acid and 0.4% formic acid. Éwe further stated that the Compound Elixir of Glycerophosphates develops a precipitate within a few months. The precipitation was reduced by increasing the lactic acid content, and was completely corrected by substituting phosphoric acid instead.

Dekay and Lee (262) found that samples of the official Elixir of Ferric Pyrophosphate, Quinine and Strychnine underwent a color change which was roughly proportional to a simultaneous increase in p_H. Those samples which were carefully neutralized in their preparation were most constant in p_H but the neutralization did not affect their stability.

Thompson and his co-workers (296) reported that the p_H values of Spirit of Ethyl Nitrite changed greatly during deterioration. The following are the p_H values of different samples corresponding to the ethyl nitrite content during 23 months' storage:

4.25% (fresh)	2.95%	1.54%	0.00%	0.00%
p_H 0.82	p_H 0.46	p_H 1.00	p_H 5.95	p_H 4.34

Davis (197), (198) reported the p_H of various hypochlorite preparations as follows: Dakin's Solution, p_H 9.71; Eusol, p_H 7.21; Daufresne's Solution, p_H 10.23; 1% Chloramine, p_H 10.05. Eusol decomposed more rapidly than the more alkaline Dakin's Solution. When Davis prepared mixtures of chlorinated lime, sodium carbonate and boric acid, p_H 9.53 was the lowest p_H value which could be obtained with stable preparations.

Noyes and Wilson (52) obtained evidence that hypochlorous acid ionizes in an amphoteric fashion, forming both positive and negative chlorine ions. They assumed the presence of two compounds, $H^+ Cl O^-$ and $Cl^+ OH^-$. Lynch and Nodder (245) have published the most extensive data concerning the ionic condition of hypochlorite solutions. They included a method for calculating the displacement of the p_H of buffer solutions, due to the presence of sodium hypochlorite. The development of the glass electrode enabled Davidson (261) to accurately determine the dissociation constant of hypochlorous acid as 3.7×10^{-8} at 20° C. He reported that bleaching powder decomposed, forming oxalic and carbonic acids with an accompanying reduction of p_H. The more alkaline solutions decomposed the least, and decomposition was much less when the acids were removed as they were formed.

p_H AND STABILITY OF ALKALOIDS.

It has been shown that p_H is an important factor in the stability of alkaloids during sterilization. It is obvious, also, that the p_H of these solutions for injection must be stabilized to a value comparable to the p_H of the blood. Trendelenburg (70), Schon (225), Regnier (285), (328), Schou (291), and Woelm (299) have pointed out the importance of buffering to the physiological p_H solutions of morphine, cocaine, tutocaine and larocaine solutions which are intended for injection. This buffering is necessary not only to counteract the alkaline tendency of the glass containers but to prevent a spontaneous change in hydrogen-ion concentration as a result of the decomposition of a small amount of the alkaloid.

Dietzel and Huss (111) studied the decomposition of morphine at high temperatures and at different p_H values. The decomposition was detected by changes in the absorption spectrum. At p_H values of less than 5.5, the morphine was stable for 60 minutes at 100° C. Neutral and alkaline solutions were very unstable. The free morphine was not any less stable than the morphine hydrochloride, the decomposition being due to oxidation by hydroxyl-ion catalysis. It was found that alkaline glass caused decomposition at room temperature. Dietzel (311) verified his results in 1934 and again attributed the stability at reduced p_H to catalytic neutrality. The p_H of morphine hydrochloride and morphine sulphate solutions is about 4.0.

Cocaine also requires an acid medium for stability and undergoes a decrease in p_H during storage and sterilization. Regnier and his co-workers (285), (286) demonstrated the change to acidity during storage and pointed out the dangers of the pharmacological use of such acid solutions. Macht and Anderson (98) and Macht and Krantz (99) reported that exposure to polarized light increased the hydrogen-ion concentration of cocaine solutions. Ditezel and Steeger (263) reported that the hydrolysis of cocaine by heat was a minimum between p_H 2–5. The type of glass container had a negligible effect. Schon and Helm (225) reported that the hydrolysis of benzoylecgonine was a minimum between p_H 2–7. When they attempted to buffer cocaine solutions to the physiological p_H, hydrolysis was accelerated unless the p_H was as low as 3.4. A pure solution of cocaine hydrochloride changed in 2 months from p_H 5.17 to 4.2 without any perceptible decomposition. One buffered to p_H 6.05 showed 31% hydrolysis in the same time. Regnier and David (287) found that solutions buffered to neutrality by being saturated with calcium carbonate and magnesium carbonate retained their potency during sterilization but rapidly deteriorated afterward. Their anesthetic power was inferior to that of pure solutions of cocaine. Regnier and David (327), (328) later reported that solutions of cocaine buffered by NaH_2PO_4 almost completely deteriorated during sterilization, but those buffered by acetic acid and sodium citrate retained their activity. Dietzel (311) reported that of the various cocaine salts, cocaine sulphate was most stable during the first 25 hours of heating. The p_H of cocaine sulphate solutions is about 5.2.

Dietzel and Steeger (263) determined the dissociation constants for cocaine and its hydrolysis products. The results were as follows:

Cocaine		2.4×10^{-6}
Methylecgonine		3.0×10^{-6}
Benzoylecgonine	$\frac{(\text{benzoylecgonine})\,(OH^-)}{(\text{benzoylecgonine})}$	1.9×10^{-12}
	$\frac{(\text{benzoylecgonine})\,(H^+)}{(\text{benzoylecgonine})}$	1.8×10^{-18}
Ecgonine	$\frac{(\text{ecgonine})\,(OH^-)}{(\text{ecgonine})}$	6.0×10^{-12}
	$\frac{(\text{ecgonine})\,(H^+)}{(\text{ecgonine})}$	7.6×10^{-12}

The authors pointed out that in the choice of an acid to be combined with cocaine, its dissociation constant must not be smaller than that of methylecgonine or cocaine, that is, not smaller than 10^{-6}. Otherwise the dissociation forms hydroxyl ions which promote hydrolysis by hydroxyl-ion catalysis.

Abildgaard (190) reported that solutions of procaine hydrochloride in hydrochloric acid showed no appreciable decomposition when heated. Under the same conditions and in a pure water solution, 5% of the procaine hydrochloride was hydrolyzed, and, when buffered to a p_H of 6.5, 19–35% was hydrolyzed. Wiedhopf (231) claimed that pantokain is very stable and can withstand several hours' boiling near the neutral point. An aqueous solution has a p_H of 7.0 and a 1% solution in physiological salt solution has a p_H of 6.7. Procaine was more easily hydrolyzed. Schou and Staggemeier (291) reported that tutocaine, when heated to 120° C. for 20 minutes, decomposed 24% at p_H 7.0 and 12.2% at p_H 6.5. Under the same conditions larocaine decomposed 20.9% at p_H 7.0 and 11.4% at p_H 6.5. The solutions were adjusted with phosphate buffers. Dietzel and Kuhl (310) reported that during storage of eucaine hydrochloride the p_H dropped from 6.98 to 5.26 in 1 year with 39.7% decomposition. Heat sterilization or exposure to oxygen did not hasten the decomposition.

Schou and Bjerregaard (249) have studied the decomposition of atropine and homatropine solutions. Pure 0.4% aqueous atropine sulphate was sterilized for 20 minutes at 120° C. with only 3.4% hydrolysis. Buffering to higher p_H values caused greater loss. Pure 0.4% aqueous homatropine hydrobromide was less stable and decomposed 8.2% under the same conditions. Complete hydrolysis occurred at p_H 7.3 and above.

Biddle and Watson (28) noted that changes in the hydrogen-ion concentration caused a change in the ionic condition of the cinchona alkaloids. Dietzel and Sollner (149) have elaborated on this work. They stated that in the water-soluble salts of quinine, quinidine and cinchonidine, the nitrogen of the quinuclidine ring is ionized while the nitrogen of the quinoline ring is not. In the presence of an excess of acid, the latter nitrogen ionizes and forms salts. With decreasing p_H there was in each case an increase of optical rotation which paralleled the ionization of the quinoline nitrogen. Macht and Anderson (99) reported that quinine and cinchonidine salts decreased in toxicity upon exposure to polarized light.

Dietzel (311) reported that hydrastine decomposed very rapidly at 100° C. but that hydrastinine showed very little change. Decomposition of berberine was very slight and evidently was not altered by an increase in hydrogen-ion concentration.

Gifford and Smith (265) reported that physostigmine and pilocarpine decomposed more rapidly in an alkaline buffer solution of p_H 7.6 than in an acid buffer solution of p_H 5.5.

p_H AND STABILITY OF MISCELLANEOUS ORGANIC COMPOUNDS.

Nielson (284) reported that the decomposition of sodium luminal increased with increasing p_H. A 10% solution has a p_H of about 8.9. A 10% solution decomposed 1.0% in 3 weeks at room temperature and 22% in 1 month at 39° C. Madsen (319) reported that the decomposition of sodium barbital also increased with increasing p_H. A 10% solution has a p_H of 8.9; the decomposition was accompanied by a decrease in p_H. Sixty minutes at 100° C. caused 2.5% decomposition of the sodium barbital with the formation of diethylacetylurea.

Kolthoff (128) claimed that the decomposition of a thiosulphate with acid was due to the formation of the undissociated thiosulphuric acid which is unstable. Schou and Bennekou (290) stated that sodium thiosulphate solutions could be sterilized without decomposition only when the p_H was 7.0. The solutions were adjusted by phosphate buffers.

Macht and Shohl (37) have published data concerning the decomposition of benzyl alcohol solutions. Solutions stored in insoluble glass were stable over long periods of time but showed a slight increase in hydrogen-ion concentration. Solutions stored in soft or alkaline glass quickly became alkaline and rapidly deteriorated. The deterioration was evidently an oxidation process. The authors claimed that the oxidation was hastened by neutralizing the benzoic acid which was formed. It was recommended that solutions of benzyl alcohol be sealed in hard glass containers with the addition of a buffer to keep the p_H between 6.8–7.0.

Nijhoff and Van Oort (171) found that urotropin solutions could not be sterilized by boiling because of decomposition into ammonia and formic acid. The type of glass did not influence the decomposition. The authors recommended that urotropin be sterilized by tyndallization after the addition of 2% of sodium bicarbonate.

Levy and Cullen (36) found that the autoclaving of strophanthin solutions changed the reaction from p_H 6.0 to p_H 9.0. This increase in p_H greatly reduced the biological action of strophanthin. Autoclaving at p_H 5.0 caused only 2% deterioration. Haag and Hatcher (127) have

also demonstrated the alkaline instability of strophanthin. They reported that ouabain solutions slowly decomposed in ampuls of hard glass.

Dubrisay and Emschwiller (237) have completed a thorough study of the decomposition of iodoform. Iodoform in solution was oxidized by light with the formation of iodine and hydriodic acid, which, in turn, accelerated further oxidation. Other mineral acids promoted oxidation, whether in the light or dark. Oxidation was the slowest with ether, carbon disulphide or toluene as the solvent. Very small amounts of phenol or hydroquinone retarded the oxidation.

Lindholm (276) reported that hydrogen peroxide solutions were stabilized by the addition of any one of the following: acetanilid, quinine hydrochloride, urea, methyl parahydroxybenzoate, acetphenetidin, oxalic acid and iodine. A 3% peroxide solution was stabilized by 0.04% iodine for 5 years.

Pertaining to the stabilization of phenol, Vergez (252) stated that a solution containing 20 Gm. of phenol, 8 Gm. of crystalline boric acid and 1000 cc. of water remained unchanged for 18 months.

In 1929, Smith and his co-workers (136) reported the finding of large discrepancies in the p_H values of commercial neoarsphenamine. The values ranged from p_H 5.80–8.74. Upon dilution, some samples increased in p_H and others decreased.

GENERAL PRINCIPLES CONCERNING p_H AND STABILITY.

Much work has been performed which, at the present time, has little practical application in the stabilizing of drugs. However, the results of these investigations have established certain fundamental principles which can broaden our conception concerning the mechanism of the ionic condition.

For instance, Kolthoff (128) has shown conclusively that ions which are in an adsorbed state possess reaction qualities different from those of free ions. If the ions of the reacting substance are adsorbed upon some stratum, the reaction is greatly retarded and, if the ions of a product of a reaction are adsorbed, the reaction is greatly accelerated. In his experiments the ions were adsorbed upon charcoal.

Kiehl and Hansen (84) have investigated the ionization during the hydration of pyrophosphates. By the use of reference curves obtained by making hydrogen-ion concentration measurements on synthetic solutions and plotting the molar concentrations of hydrogen ions against the molar concentrations of disodium orthophosphate, each hydration was followed to completion by hydrogen-ion concentration measurements. The hydrogen-ion concentration decreased progressively with time, reaching a final fixed value as complete conversion to the orthophosphate occurred. This fact indicates that pyrophosphoric acid produces more hydrogen ions than does orthophosphoric acid and, consequently, that the withdrawal of hydrogen ions will displace the reaction toward the pyro acid.

Buchanan and Barsky (144) reported that the rate of polymerization of cyanamide is a function of the hydrogen-ion concentration, the velocity of the reaction being greatest at p_H 9.6 and decreasing rapidly above and below this point. Between p_H 6–10 the polymer alone (param or cyanguanidine) was formed. Between p_H 10–12 both the polymer and urea were formed. Above p_H 12 no polymerization occurred and only urea was formed. Zappi and Williams (255) noted also that there was an optimum p_H in the region of 9.5 for the polymerization of aldehydes. Zappi's article was also of interest concerning the effect of p_H upon the concentrations of the tautomeric forms of aldehydes.

Volfkovich (253) and Bryan (258), (259) have demonstrated the presence of a transition point at p_H 4.3 between the two types of oxidation, addition of oxygen and hydrogen evolution. The hydrogen evolution occurred below p_H 4.3. This was applied experimentally to iron salts and to sulphites.

Bolin (107) has determined a number of p_H values for the maximum stability against hydrolysis of esters. The reactions occurred at 25° C. unless stated otherwise. His results indicate that esters are hydrolyzed by hydrogen- and hydroxyl-ion catalysis. He drew the following conclusions: For esters of fatty acids, the optimum p_H for a weak acid is lower than for a strong acid. For methyl esters, the optimum p_H is lower than for the corresponding ethyl esters. Introduction of a phenyl group lowers the optimum p_H and increases the ve-

locity of decomposition. Bolin claimed that derivatives of secondary amines and similar compounds which are not prone to hydrolysis are most stable at p_H 7.0.

	p_H.		p_H.
Ethyl butyrate	5.65	Ethyl phenylacetate	4.9
Methyl benzoate	4.0 (80° C.)	Ethyl acetoacetate	4.4
Ethyl benzoate	4.15 (80° C.)	Ethyl alphachloropropionate	4.0
Phenyl acetate	4.1	Ethyl hippurate	4.4
Benzyl acetate	4.3	Methyl acetanilide	6.0

Olivier (134) claimed that the influence of the hydrogen-ion concentration upon hydrolysis is conditioned by the nature of the organic compound. Such an influence is absent in alkyl halides and acid chlorides, as well as in other compounds in which the water molecule, as such, may be expected to add directly. Olivier further stated that the concordant and regular influence of the substituents upon the hydrogen ion catalyzed hydrolysis of esters are best explained by the theories of induced alternating polarities of Lapworth, Kermak and Robinson. For further information concerning the reaction of different molecular structures to hydrogen-ion catalysis the reader is referred to Olivier (321), (322), (323).

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(322) Olivier, S. C. J. *Rec. trav. chim.*, 53, 891. Through *C. A.*, 28, 6122.
(323) Olivier, S. C. J., and Weber, A. P. *Rec. trav. chim.*, 53, 899. Through *C. A.*, 28, 6122.
(324) Osborn, T. W. B. *Biochem. J.*, 28, 423.
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Astringent Mouth Wash.

(Zinc Chloride Type.)

Zinc Chloride	2.0 Gm.
Menthol	0.6 Gm.
Oil of Cinnamon	1.4 cc.
Oil of Clove	0.3 cc.
Formaldehyde	0.4 cc.
Saccharin	0.4 Gm.
Alcohol	40.0 cc.
Water *q. s.* ad.	1000.0 cc.

A mouth wash preferred by some who desire the astringent effect of a zinc salt.

Mouth Rinse No. 1.

Saccharin, Soluble	0.10 Gm.
Fuchsin, basic	0.02 Gm.
Oil of Cinnamon	0.25 cc.
Oil of Peppermint	0.25 cc.
Oil of Clove	0.50 cc.
Alcohol	300.00 cc.
Talc	10.00 Gm.
Distilled Water, *q. s.*	1000.00 cc.

This makes a pleasant sweet spicy mouth rinse when diluted with 2–3 parts of water. No medication is intended in this formula. Especially suitable for the Spray Bottle.

Mouth Rinse No. 2.

Thymol	0.50 Gm.
Menthol	1.00 Gm.
Oil of Peppermint	3.00 cc.
Alcohol	300.00 cc.
Distilled Water, *q. s*,	1000.00 cc.
Color to suit.	

A pleasant mint-flavored mouth wash to be used diluted 2–3 times with water. Especially suitable for the Spray Bottle.

ASSOCIATION BUSINESS

AD INTERIM BUSINESS OF THE COUNCIL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION, 1934–1935.

March 28, 1935.

Office of the Secretary, 2215 Constitution Avenue, Washington, D. C.

LETTER NO. 15.

To the Members of the Council:

78. Committee on National Formulary. Recently Mr. Oliver A. Farwell submitted his resignation as a member of the A. PH. A. and as a member of the Committee on N. F. because of his retirement from active work.

The By-Laws provide that "Whenever deemed advisable by the Council, it shall after the publication of each edition of the National Formulary, appoint a committee of 15 members from the general membership of the ASSOCIATION, which committee shall have charge of the revision of the Formulary. This committee shall report annually, or as often as required, to the Council, and shall continue to serve for a term of ten years or until their successors are appointed. Vacancies occurring in this committee shall be filled by the Council as quickly as is expedient."

The resignation was reported to Chairman Gathercoal of the Committee, and the following letter has been received from him:

> "As you informed me that Dr. Oliver A. Farwell has resigned from the National Formulary Committee and as the work of this Committee should actively continue during the years immediately ahead, I would offer the suggestion that one of the capable pharmacognosists of the United States be elected to the Committee to take the place occupied by Dr. Farwell
>
> "There are several very splendid and experienced men in the group of younger pharmacognosists who have been somewhat active as auxiliary members in the work of the present revision. Among these, Dr. E. H. Wirth has taken an unusually active part and has been of great assistance to me. It gives me pleasure to recommend him as a nominee for this vacant place on the N. F. Committee."

If members of the Council desire to submit other nominees for the vacancy, they are requested to do so promptly.

79. Honorarium for Editor of the Recipe Book I. At a recent meeting of the Executive Committee of the Council and in connection with a vote to make an appropriation for the editing of the copy for Recipe Book II, Dr. LaWall called attention to the fact that Professor Ivor Griffith had not been paid anything for his work as editor of the Recipe Book I. $1000.00 was appropriated for the editing of the Recipe Book I and this amount plus an added appropriation was expended for clerical and other assistance in the work.

The following letter was received from Dr. LaWall:

> "I wish to make a motion that inasmuch as Professor Ivor Griffith never received any remuneration for the long and arduous work of editing the manuscript for the first edition of the Recipe Book that he be paid an honorarium of $500 for this service."

and the following letter from Dr. James H. Beal:

> "Returning from a trip North, I find your letter of inquiry regarding the proposed honorarium to Dr. Ivor Griffith awaiting attention.
>
> "I recall that the matter was discussed in Council on several occasions and that there was a general understanding that the payments made to Dr. Griffith were

solely on account of the clerical services which he was obliged to procure. It was my understanding, also, that an honorarium would be tendered to him for his own valuable services as Editor of the manuscript of the text of the Recipe Book at some future date. I do not recall that any formal motion to that effect was adopted, but the sum of $500.00 was named in the discussion, and it was also suggested that the honorarium be paid after the Recipe Book had been issued and placed on sale.

"I feel sure that Dr. Griffith abundantly deserves such recognition, and would be glad to second a motion awarding him the honorarium of $500.00."

(*Motion No. 29*) *It is moved by LaWall that Professor Ivor Griffith be paid an honorarium of $500.00 for his services as Editor of the Pharmaceutical Recipe Book, First Edition, and that this sum be added to the appropriation for the Recipe Book in the Budget for 1935.*

A vote on this motion will be called for in about two weeks.

80. Life Members. E. Fullerton Cook, Philadelphia, Pa., Charles Morgan, Baltimore, Md., and Leonard A. Seltzer, Detroit, Mich., have become Life Members through the payment of dues for thirty-seven years, and Edwin R. Westmoreland, Lockhart, Texas, through membership since 1910 and the payment of $25.00.

81. Applicants for Membership. The following applications properly endorsed and accompanied by the first year's dues have been received:

No. 110, Douglas Carleton Fernlock, 6159 Commonwealth, Detroit, Mich.; No. 111, Glendouglas Gordon Stewart, 810 Broadway, Saskatoon, Canada; No. 112, Horace E. Grant, 238 Highland St., Portsmouth, N. H.; No. 113, Morris M. Daffner, 1068 Willett St., Schenectady, N. Y.; No. 114, Richard Roubos, P.O. Box No. 7, Oakdale, Calif.; No. 115, Joseph Frank Tandy, 323 E. Forest Ave., Detroit, Mich.; No. 116, Harry Lindstrom, 1220 Eddy St., Chicago, Ill.; No. 117, Buford Lee White, University Station, Gainesville, Florida; No. 118, Elbert Voss, University of Florida, Gainesville, Fla.; No. 119, Walter Dennis Griffin, Jr., Pi Delta Sigma House, Gainesville, Fla.; No. 120, Robert Gerald Goedhart, 414 N. Pleasant St., Gainesville, Fla.; No. 121, E. Herbert Gilliland, Route No. 4, Gainesville, Fla.; No. 122, Cleveland Joseph Bourgeois, 200 S. Wilson St., Gainesville, Fla.; No. 123, Harvey A. Henry, Sixth & St. Paul, Los Angeles, Calif.; No. 124, Sister M. Conchessa, College of St. Catherine, St. Paul, Minn.; No. 125, Joseph Harrison Beckwith Murray, U. S. Veterans Admn. Pharmacy, S. L. C., Utah; No. 126, Nathan Isaac Liss, 1818 N. Smallwood St., Baltimore, Md.; No. 127, Edgar A. O'Harrow, 110 S. Indiana Ave., Bloomington, Ind.; No. 128, Vincent B. Norelli, 1121—17th St., N. W., Washington, D. C.; No. 129, Sister Mary Oswalda Flaherty, 2010 Adams Ave., Scranton, Penna.; No. 130, Anthony Scacciaferro, 665 Summer Ave., Newark, N. J.; No. 131, Isaac J. Epstein, 2552—8th Ave., New York, N. Y.; No. 132, William O. Smith, 1656 W. Va. Ave., N. W., Washington, D. C.; No. 133, Michael James Ward, 39 Main St., Westernport, Md.; No. 134, Morris Heron Wise, 921 S. Bonnie Brae, Los Angeles, Calif.; No. 135, George Ross Fowler, 245 S. Oxford Ave., Los Angeles, Calif.; No. 136, John R. Leach, 6615 S. E. Foster Rd., Portland, Ore.; No. 137, S. A. Matthieu, 1 N. Russell St., Portland, Ore.; No. 138, Herbert C. Miller, Pres. North Pacific College, Portland, Ore.; No. 139, Edmund Herman MacLaughlin, 43d & Kingsessing, Philadelphia, Pa.; No. 140, Irving P. Biber, 119 Aldine St., Newark, N. J.; No. 141, Vincent Michael Matteis, 458 Lafayette Ave., Brooklyn, N. Y.; No. 142, William George Healey, Jr., 226 S. Clinton St., Baltimore, Md.; No. 143, Dorothy Stain, 2412 Eutaw Place, Baltimore, Md.; No. 144, Alexander John Ogrinz, 2210 Prentiss Place, Baltimore, Md.; No. 145, Victor E. Levine, 14th & Davenport Sts., Omaha, Nebr.; No. 146, Carl H. Johnson, 1307 E. 41st St., Seattle, Wash.; No. 147, Charles Homer Jackson, P. O. Box 309, Mountain Grove, Mo.; No. 148, Shozo Miyaki, Lahaina Maui, Hawaii; No. 149, Henry J. Plowhead, 3326 N. E. Clackamas, Portland, Ore.; No. 150, Edgar Stipe, 605 S. W. 4th Ave., Portland, Ore.; No. 151, Peter T. Ingram, 900 West End Ave., New York, N. Y.; No. 152, William D. Grady, 512 Edwards St., R. D. No. 5, Johnstown, Penna.; No. 153, Frances Garman, Box 192, College Sta., Pullman, Wash.; No. 154, Glen Smith, 510 Campus Ave., Pullman, Wash.; No. 155, Arthur Johnson, 403 Pioneer Way, Pullman, Wash.; No. 156, Forest Marvin Klick, 103 S. Fifth Ave., St. Charles, Ill.; No. 157, William S. Maltman, 123 Printz Ave., Norwood, Pa.; No. 158, Howard Zimmer, Route No. 2, Canby, Oregon; No. 159, Edward J. Prochaska, Pine City, Minn.; No. 160, Margaret Anne Pearson, Children's Hospital, Washington, D. C.; No. 161, Ernest DeWitt Reason, c/o S. E. Massengill Co., Bristol, Tenn.; No. 162, Harry Kaye, Whalen Drug. Co., 82—39th St., Brooklyn, N. Y.; No. 163, Elmer A.

Buerge, 10514 E. Jefferson, Detroit, Mich.; No. 164, Melvin Hanlin, Y. M. C. A., Indianapolis, Ind.; No. 165, Helen Glucksman, 2801 Boulevard, Jersey City, N. J.; No. 166, Lillian K. Chin, 414 W. Saratoga St., Baltimore, Md.; No. 167, William Tombari, College Sta., Pullman, Wash.; No. 168, Theodore Schlosser, c/o W. L. Dillon, Rt. 3, Pullman, Wash.; No. 169, Olive Conant, College Sta., Pullman, Wash.; No. 170, Roy Christensen, College Hospital, Pullman, Wash.; No. 171, John Vibber, S.P.E. House, Pullman, Wash.; No. 172, Arthur Miller, College Sta., Pullman, Wash.; No. 173, Herman Forslund, 902 Colorado, Pullman, Wash.; No. 174, Emily Giles, Cliff House, Pullman, Wash.; No. 175, Stanley George Mittelstaedt, 1211 Morton St., Pullman, Wash.; No. 176, Orion Furness, 405 Colorado, Pullman, Wash.; No. 177, Maxine Gumz, College Sta., Pullman, Wash.; No. 178, Jack Engeln, 906 Thatuna, Pullman, Wash.; No. 179, Victor Himmelfarb, 408 Queen St. W., Toronto, Ont., Canada; No. 180, Howard Stephenson, 572 Madison Ave., New York, N. Y.; No. 181, Frank Reinish, 8 Eliott St., Morristown, N. J.; No. 182, John W. Widmann, Bellefonte Ave., Lock Haven, Penna.; No. 183, Melvin A. Widmann, Bellefonte Ave., Lock Haven, Pa.; No. 184, Lester F. Widmann, 220 W. Water St., Lock Haven, Pa.; No. 185, Philip A. Teah, Water & Vesper Sts., Lock Haven, Pa.; No. 186, Sister M. Alphonsa Schorp, 365 Ridge Ave., Evanston, Ill.; No. 187, Feliks L. Wiatrowski, 807 W. Thomas St., South Bend, Ind.; No. 188, Frederick Francis Johnson, 4515—16th Ave., N. E., Seattle, Wash.; No. 189, Samuel T. Helms, Bromo-Seltzer Tower Bldg., Baltimore, Md.; No. 190, Laird C. Dinsmore, 93 Henry St., Brooklyn, N. Y.; No. 191, Taylor W. Hoskins, State Board of Health, Louisville, Ky.; No. 192, Doris Beauchamp, College Station, Pullman, Wash.; No. 193, Marjorie Whiteside, College Sta., Pullman, Wash.; No. 194, Robert L. Johnson, Hillcrest Apt. No. 14, Pullman, Wash.; No. 195, Sister Mary Esther, Berry & Broadway, Fort Wayne, Ind.; No. 196, Jack A. Dascoll, 40 Cook Ave., Madison, N. J.; No. 197, Emil Gottesman, 414 E. 169th St., New York, N. Y.; No. 198, Leon Rose, 241 W. 101st St., New York, N. Y.; No. 199, Christian F. Wight, 314—20th St., West New York, N. J.; No. 200, Vincent Anthony Lapenta, 711 Indiana Pythian Bldg., Indianapolis, Ind.

(*Motion No. 30*) *Vote on applications for membership in the American Pharmaceutical Association.*

E. F. KELLY, *Secretary.*

LETTER NO. 16.

May 7, 1935.

To the Members of the Council:

82. Year Books for the Library of Congress. Motion No. 26 (Council Letter Nos. 12, page 167; and 14, page 426) has been carried.

83. Minutes of the Meeting of the Executive Committee. Motion No. 27 (Council Letter No. 13, page 329) has been carried. President Fischelis voted "No" for the reason given in his letter of April 3, 1935, of which copies were sent to members of the Council.

84. Sale and Exchange of Liberty Bonds. Motion No. 28 (Council Letter No. 14, page 428) has been carried. President Fischelis voted "No" for the reason given in his letter of April 3, 1935, of which copies were sent to the members of the Council. The Fourth Liberty Loan Bonds referred to were delivered for exchange and sale. The U. S. Treasury Bonds, 2¹/₄%, 1955–1960, have not, as yet, been delivered and a report will be submitted promptly upon their receipt.

85. Committee on National Formulary. See Council Letter No. 15, page 509. President Fischelis has submitted the following:

> "I would like to nominate Professor Arno Viehoever of Philadelphia, for membership on the National Formulary Committee, to succeed Dr. Farwell. As you well know, Dr. Viehoever is an outstanding pharmacognosist and would, no doubt, serve in a capable manner."

(*Motion No. 31*) *As no other nominations have been received than those of Dr. E. H. Wirth and Prof. Arno Viehoever, the members of the Council are requested to vote on these two nominees.*

86. Honorarium for Editor of Recipe Book I. See Council Letter No. 15, page 509. Dr. H. V. Arny submitted the following letter:

> "Commenting on Motion No. 29 (Council Letter No. 15), I beg leave to make the following comments: (1) In 1924 an appropriation of $1000.00 was made to Dr.

Griffith to edit the manuscript of Recipe Book No. 1 as he received it from Chairman Lascoff and to carry the work through the press to its ultimate publication. (2) I learn that during 1925–1929 Dr. Griffith received $1375.66 for this purpose. (3) I, therefore, cannot see why another $500.00 appropriation be granted to Dr. Griffith especially since Chairman Lascoff has neither received nor asked for an honorarium for his fine work in behalf of the Recipe Book."

President Fischelis requested certain information with respect to the payment of honoraria, in his letter of April 3, 1935, of which copies were sent to the members of the Council. Copies of the secretary's reply of April 5, 1935, were also sent to members of the Council.

A vote on Motion No. 29 is called for at this time.

87. Election of Members. Motion No. 30 (Council Letter No. 15, page 511) has been carried and applicants for membership numbered 110 to 200 are declared elected.

88. Committee on Library and Committee on Museum. The members of the Council are requested to submit nominations for the members of these two special committees (Council Letter No. 13, page 331). Please note that the membership of these committees is not limited to Council members and is to be selected with special reference to their knowledge and experience.

89. Program of the 1935 Meeting. The tentative general program is being completed and will be submitted to the Council in an early letter.

90. Applicants for Membership. The following applications properly endorsed and accompanied by the first year's dues have been received:

No. 201, Carle Muzzy Bigelow, c/o the Calco Chemical Co., Bound Brook, N. J.; No. 202, F. W. Moudry, 5th & St. Peter Sts., St. Paul, Minn.; No. 203, Jennie Morrow Banning, St. Joseph Mercy Hospital, Sioux City, Iowa; No. 204, Michael F. Hastings, 106 High St., Clinton, Mass.; No. 205, Bernard Schneider, 1564 St. Paul St., Rochester, N. Y.; No. 206, William R. Bond, 21 Grey Oaks Ave., Nepera Park, N. Y.; No. 207, Harry A. Nuse, 155 Leonard St., New York, N. Y.; No. 208, W. O. Frohring, 4614 Prospect Ave., Cleveland, Ohio; No. 209, Evlyn Gray Scott, 11809 Cromwell Ave., Cleveland, Ohio; No. 210, Morgen Reno Hohmann, 6721 Bartmer Ave., St. Louis, Mo.; No. 211, Albert H. Musick, 624 W. 49th St., Los Angeles, Calif.; No. 212, Abraham Lynn Dubinbaum, 1501 Undercliff Ave., Bronx, New York City; No. 213, Joseph Ludwig Stummer, 23 E. 20th St., New York, N. Y.; No. 214, Hyman Ferber, 1483 Bryant Ave., New York, N. Y.; No. 215, Eugene Renaud, Fort & State Sts., Lincoln Park, Mich.; No. 216, Lucille Dahlquist, College of Pharmacy, San Francisco, Calif.; No. 217, Frederick P. McNess, 620 N. Lake St., Madison, Wis.; No. 218, Sister M. Marcina, 390 E. Division St., Fond du Lac, Wis.

(*Motion No. 32*) *Vote on applications for membership in the American Pharmaceutical Association.*

E. F. KELLY, *Secretary.*

LETTER NO. 17.

May 27, 1935.

To the Members of the Council:

91. Committee on National Formulary. Dr. E. H. Wirth has been elected as a member of this Committee to serve the unexpired term of Oliver A. Farwell.

92. Honorarium for Editor of Recipe Book I. The vote on Motion No. 29 (Council Letters No. 15, page 509; and No. 16, page 511) is not complete and the announcement will, therefore, be deferred.

93. Election of Members. Motion No. 32 (Council Letter No. 16, page 512) has been carried and applicants numbered 201 to 218, inclusive, are declared elected.

94. Committee on Library and Committee on Museum. Those members of the Council who have not submitted nominations for members of these two special committees (Council Letter 13, page 331; Council Letter No. 16, page 512) are requested to do so promptly.

95. Use of the Text of the N. F. VI. The following communication has been received through Chairman Gathercoal from Paul Nicholas Leech, Secretary, Council on Pharmacy and Chemistry of the American Medical Association:

"The Council on Pharmacy and Chemistry is about to revise its publications dealing with National Formulary products so as to bring them into conformance with the new National Formulary. It is hoped that the revisions of these books can start about June 1st. The Council has therefore directed the secretary to communicate with you and to ask for permission to quote from the National Formulary in the forthcoming editions of the following books: 'Useful Drugs,' 'Hospital Practice for Interns,' 'Epitome of the U. S. Pharmacopœia' and National Formulary.

"In order that you may know the general scope of these books a complimentary copy of each is being sent to you. It is understood, of course, that if permission is granted there will be published on the back of the title page the announcement of the permission of your Committee, such as now appears in the books being sent to you. If this statement requires any modification the Council shall be pleased to make it in accordance with the desires of the National Formulary Committee."

The request was referred to Chairman DuMez of the Committee on Publications who writes as follows:

"Inasmuch as the privilege to use portions of the text of the National Formulary for comment has been given to the American Medical Association in the past, and that ASSOCIATION has not abused the privilege, to the best of my knowledge, I can see no good reason why this privilege should not be extended as heretofore."

(*Motion No. 33*) *It is moved by DuMez that the American Medical Association be granted permission to use for partial reproduction the text of the N. F. V in its publications entitled "Useful Drugs," "Hospital Practice for Interns," and "Epitome of the U. S. Pharmacopœia and National Formulary" with the understanding that the usual notice will appear on the back of the title page of each of the publications and that these publications will not be issued until after the N. F. VI has been issued and that no charge be made.* A vote on this motion will be called for in about ten days.

96. Tentative General Program for the Eighty-Third Meeting. With the approval of President Fischelis, Local Secretary Mickelsen and the Committee on Standard Program of the Council, the secretary submits the attached tentative general program. Officials of the various affiliated organizations represented in the program have approved those features in which their respective organizations are directly interested.

The important changes suggested in the tentative program for the 1935 meeting are:

(*a*) The meeting of the Council heretofore held on Monday has been scheduled for the Saturday preceding. The object is to avoid the conflict with the sessions of the A. A. C. P. and the N. A. B. P. on Monday and to provide time for the uninterrupted consideration of the important business to come before the Council. It is understood that the meeting of the Council will be continued on Sunday if necessary.

(*b*) Provision is made for a Joint Meeting of the Council and the Executive Committee of the N. A. R. D. on Wednesday afternoon, August 7th.

(*c*) Meetings of the Committees on Nominations and on Resolutions are scheduled in order that those who may desire to appear before these Committees will have the opportunity to do so.

(*d*) The Third Session of the House of Delegates is scheduled for Friday afternoon rather than on Friday morning and the short Final Session of the House heretofore held just prior to the Final General Session on Friday evening is omitted, since the change above mentioned makes the short session unnecessary. Under the proposed arrangement, the sessions of the Sections will be completed by noon on Friday and all resolutions and actions requiring consideration by the House of Delegates can be acted upon at the Friday afternoon session. In addition, time will be available to prepare the final report of the House for consideration at the Final General Session.

In this connection, the following letter has been received from Chairman Hilton:

"I approve the Tentative Program for the Portland Meeting with the exception of the meeting of the Council on Saturday, August 3rd.

"It is my belief that this meeting of the Council should be scheduled for Sunday, August 4th, at 10 A.M. because it will be difficult to secure the attendance of

a quorum on Saturday and because the business to come before the Council can certainly be completed during a morning, afternoon and evening session on Sunday. I understand that Dean Bradley has expressed the same opinion.

"Please place this statement before the Council in submitting the Tentative Program and I suggest that, when a vote is called for, you request an opinion from the members of the Council."

(*Motion No. 34*) *It is moved by Kelly that the tentative general program of the Eighty-Third Annual Meeting be approved.* A vote on this motion will be called for in about ten days.

E. F. KELLY, *Secretary.*

TENTATIVE GENERAL PROGRAM FOR THE EIGHTY-THIRD ANNUAL MEETING OF THE AMERICAN PHARMACEUTICAL ASSOCIATION AND RELATED ORGANIZATIONS, HOTEL MULTNOMAH, PORTLAND, OREGON, AUGUST 1–10, 1935.

All dates included in special fare arrangements with railroads.

AUGUST 1–3.

Plant Science Seminar. Program to be arranged. Meetings will be held at the North Pacific College of Oregon.

SATURDAY, AUGUST 3.

10:00 A.M. Council A. PH. A.—Cameo Room.
2:00 P.M. National Conference on Pharmaceutical Research—Assembly Hall.
8:00 P.M. National Conference on Pharmaceutical Research—Assembly Hall.

SUNDAY, AUGUST 4.

8:00 P.M. American Council on Pharmaceutical Education—Empire Room.

MONDAY, AUGUST 5.

9:00 A.M. N. A. B. P.—Assembly Hall.
9:00 A.M. A. A. C. P.—Executive Committee—Empire Room.
9:00 A.M. A. A. C. P.—Teachers Conferences.
Chemistry Conference—Club Room.
Pharmacy Conference—Junior Ball Room.
Pharmacognosy and Pharmacology Conference—Colonial Room.
Pharmaceutical Economics Conference—Marine Room.
1:30 P.M. N. A. B. P.—Assembly Hall Room.
1:30 P.M. A. A. C. P.—Junior Ball Room.
6:00 P.M. Dinner, N. A. B. P.—Assembly Hall Room.
6:00 P.M. Dinner, A. A. C. P.—Marine Room.
8:00 P.M. A. A. C. P.—Junior Ball Room.
9:30 P.M. Reception—(Informal) followed by dancing—Masonic Temple Ball Room.

TUESDAY, AUGUST 6.

9:00 A.M. Joint Meeting N. A. B. P. and A. A. C. P.—Assembly Hall.
12:15 P.M. Luncheon, Committee on National Formulary.
1:30 P.M. First Session, House of Delegates—Grand Ball Room.
2:30 P.M. N. A. B. P.—Assembly Hall.
2:30 P.M. A. A. C. P.—Junior Ball Room.
6:30 P.M. Banquet, A. PH. A. and Related Organizations—Masonic Temple Ball Room.

WEDNESDAY, AUGUST 7.

9:00 A.M. First General Session, A. PH. A.—Grand Ball Room.
12:15 P.M. Luncheon, Syllabus Committee.
2:00 P.M. First Session, Scientific Section—Assembly Hall.
2:00 P.M. First Session, Section on Education and Legislation—Colonial Room.
2:00 P.M. First Session, Section on Commercial Interests—Marine Room.
2:00 P.M. First Session, Section on Historical Pharmacy—Rose Room.
2:00 P.M. First Session, Conference of Pharm. Assoc. Secretaries—Club Room.
3:00 P.M. Joint Meeting, Executive Committee, N. A. R. D. and Council, A. PH. A.—Cameo Room.

3:00 P.M. Meeting Committee on Nominations—Empire Room.
6:00 P.M. Dinner, Rho Chi Fraternity followed by Annual Convention.
6:00 P.M. Dinner, Lambda Kappa Sigma Sorority.
8:00 P.M. Second Session, House of Delegates—Grand Ball Room.

THURSDAY, AUGUST 8.

9:00 A.M. Council A. PH. A.—Cameo Room.
9:00 A.M. Second Session, Section on Commercial Interests—Marine Room.
9:00 A.M. Second Session, Scientific Section—Assembly Hall.
9:00 A.M. First Session, Section on Practical and Dispensing—Grand Ball Room.
9:00 A.M. Second Session, Section on Historical Pharmacy—Rose Room.
9:00 A.M. First Session, Conference of Law Enforcement Officials—Club Room.
12:00 M. Veteran Druggists' Luncheon.
2:00 P.M. Second General Session, A. PH. A.—Grand Ball Room.
6:00 P.M. Dinner, Kappa Psi Fraternity.
6:00 P.M. Dinner, Phi Delta Chi Fraternity.
6:00 P.M. Dinner, Kappa Epsilon Fraternity.
8:00 P.M. Joint Session, Scientific Section and Section on Practical Pharmacy and Dispensing—Assembly Hall.
8:00 P.M. Joint Session, Section on Education and Legislation, Conference of Pharmaceutical Law Enforcement Officials, and Conference of Pharmaceutical Assoc. Secretaries—Junior Ball Room.
8:00 P.M. Meeting Committee on Resolutions—Rose Room.

FRIDAY, AUGUST 9.

9:00 A.M. Third Session, Scientific Section—Assembly Hall.
9:00 A.M. Second Session, Section on Practical Pharmacy and Dispensing—Grand Ball Room.
9:00 A.M. Second Session, Section on Education and Legislation—Colonial Room.
9:00 A.M. Second Session, Conference of Law Enforcement Officials—Junior Ball Room.
9:00 A.M. Second Session, Conference of Pharmaceutical Association Secretaries—Club Room.
1:00 P.M. Meeting, Committee on Resolutions—Rose Room.
2:00 P.M. Final Session, House of Delegates—Grand Ball Room.
5:45 P.M. Dinner, Former Presidents, A. PH. A.—Multnomah Hotel.
6:00 P.M. Special Dinners.
8:00 P.M. Final General Session, A. PH. A.—Assembly Hall.
10:00 P.M. Farewell Party—Grand Ball Room.
10:00 P.M. Council A. PH. A.—Cameo Room.

SATURDAY, AUGUST 10.

9:30 A.M. An all-day scenic drive up the Columbia River Highway including a visit to the Bonneville Dam and an out-door luncheon featuring Columbia River salmon.

PARTIAL LIST OF PAPERS OF THE SECTIONS, CONFERENCES, ETC.

Officers who have not reported will please mail programs as far as they have been completed, *by Special Delivery*, to the Editor of the JOURNAL, A. PH. A., 2215 Constitution Ave., Washington, D. C. *This request is made, because it is necessary for the preparation of the program.*

Contributors should at once send in their papers to Section and Conference Officers. **See list of Officers under Societies and Colleges in this issue of the JOURNAL.**

SCIENTIFIC SECTION.

Members and Friends of the Scientific Section, American Pharmaceutical Association:

The 83rd annual meeting will be held in Portland, Oregon, during the week of August 5th.

The Scientific Section will hold several sessions and for the officers to plan these sessions, we should know as early as possible not only the titles of the papers to be presented, but

also have short abstracts of them. With this information the program can be arranged so as to group the papers on a common subject.

It is now only about four weeks before the convention, and authors of papers should advise the secretary promptly, giving titles of the papers which they will present, and also note if they expect to be present in person or if the paper is to be presented by title.

The By-Laws provide that papers shall be presented in duplicate, so that one copy will be available for publication and the other can be referred to the Committee on Ebert Prize. In writing the paper, the authors should follow the procedure as outlined in the March JOURNAL, page 256. (Also on the page facing the Abstract Section of each issue of the JOURNAL.) When submitting your title, also inform the secretary whether a lantern will be required for the presentation.

FRANCIS E. BIBBENS, *Secretary.*

PARTIAL LIST OF PAPERS FOR SCIENTIFIC SECTION, A. PH. A.

"A Study of Lacinaria Species," B. V. Christensen and G. M. Hocking.

"The Assay of Organic Medicinal Preparations Containing Arsenic," Edward J. Hughes.

"Modern Pharmaceutical Research Problems," Henry J. Goeckel.

"Absorption of Drugs by the Human Skin," A. Richard Bliss, Jr.

"The Microscopy of Powdered Desiccated Thyroid and Suprarenal Glands," Heber W. Youngken.

"Antiseptics: A Comparative Study of Laboratory and Practical Tests," George F. Reddish.

PARTIAL LIST OF PAPERS FOR SECTION ON PRACTICAL PHARMACY AND DISPENSING.

"Improvement in Technique in the Preparation of Three Common Products," Edward D. Davy.

"Professional Pharmacy," Ernest T. Stuhr.

"Potent Medicaments in Sugar-Coated Pills and in Confections," John F. Suchy.

"Difficult Prescriptions, Series No. 4," J. Leon Lascoff.

"Enteric Pill Coatings," F. S. Bukey.

"The Hospital and the Pharmacist, Some Observations in Establishing a Department of Pharmacy in a Hospital," H. C. McAllister.

"Studies on Three U. S. P. and N. F. Preparations by Shortened Procedures," Henry M. Burlage and W. J. Smith.

The following have promised papers to the Section: Carl Gibson, C. George Hamilton, George Secord, R. P. LeRoy, Thomas G. Wright, William F. Reindollar, J. Solon Mordell, P. W. Howard, R. L. Swain, L. M. Kantner, Marvin J. Andrews.

PARTIAL LIST OF PAPERS FOR SECTION ON COMMERCIAL INTERESTS.

"The Pharmacist Studies Law," Charles G. Ajax.

"How to Help the Pharmacist Commercially," Eugene C. Brokmeyer.

"A Study of the Commercial Pharmacy Curriculum," Neal Bowman.

"What Determines Net Profit?" C. Leonard O'Connell.

"The Fair Trade Acts and Their Effects," Paul C. Olsen.

"The Selling Price of Prescriptions," Frank A. Delgado.

"The Open-View Prescription Department," Frank A. Delgado.

"Merchandising Your Profession," Ralph A. Beegle.

"The Need of Commercial Training in Colleges of Pharmacy," Ralph A. Beegle.

"Dogs, Cats, Birds and Babies," Alice-Esther Garvin.

"The Futility of Cutting Prices and a Comparative Price Survey of Two States—One with a Price Maintenance Act," George F. Archambault.

"The California Fair Trade Act," Ira J. Darling.

"Vaccines and Serum Products of U. S. P. XI," Clarence M. Brown.

PARTIAL LIST OF PAPERS FOR SECTION ON HISTORICAL PHARMACY.

"A Brief History of the Drug Code," E. F. Kelly.

"The First Pharmacist in North America," T. J. Bradley.

"Medicine Making as Depicted by Museum Dioramas," Charles Whitebread.

"Honoring Age and Service," John E. Kramer.

"The Origin and Development of Pharmaceutical Education in the United States," Ernest T. Stuhr.

"Report of the Pharmacy Exhibit at the World's Fair during 1933 and 1934," H. C. Christensen.

"History of the Darflinger Druggist's Show Globes," Robert W. Rodman.

"David Henshaw, the Druggist's Secretary of the Navy," George E. Ewe.

"The Pharmaceutical Museum at the University of Minnesota," Frederick J. Wulling.

"Drugs of the Bible,"A. R. Bliss, Jr.

"The Ancient Medicinal Uses of Gems and Precious Stones," A. R. Bliss, Jr.

"William Withering and the Introduction of Digitalis into Medical Practice," Louis H. Roddis.

"Estonian Pharmacy," Rudolf Wallner.

Thirty-Second Annual Meeting of the

NATIONAL ASSOCIATION OF BOARDS OF PHARMACY.

HOTEL MULTNOMAH, PORTLAND, OREGON, AUGUST 5–6, 1935.

OFFICERS.

President, C. H. Evans; *Honorary President*, F. W. Hancock; *Vice-Presidents*, George Moulton, John Woodside, E. V. Zoeller, Albert Ely, Wm. Muesing, C. M. Brewer, R. C. Shultz, R. W. Fleming; *Secretary*, H. C. Christensen; *Treasurer*, J. W. Gayle.

Program.

MONDAY, AUGUST 5, AT 9:30 A.M.—FIRST SESSION.—ASSEMBLY HALL ROOM.

1. Call to Order, President C. H. Evans.
2. Roll Call.
3. Appointment of Committee on Credentials, President C. H. Evans.
4. President's Address, Charles H. Evans.
5. Appointment Committee on President's Address.
6. Report of Secretary, H. C. Christensen.
7. Report of Treasurer, J. W. Gayle.
8. Appointment of Nominating Committee, President Evans.
9. Report of Executive Committee, A. L. I. Winne, *Chairman*.
10. Presentation of Suggested Amendments to Constitution and By-Laws, L. C. Lewis, *Chairman*.

MONDAY, AUGUST 5, AT 1:30 P.M.—SECOND SESSION.—ASSEMBLY HALL ROOM.

1. Report of Advisory Examination Committee, H. C. Christensen, *Chairman*.
2. Report of Syllabus Committee.
3. Report of Legislative Committee, Mac Childs, *Chairman*.
4. Report of Committee on National Legislation, R. L. Swain, *Chairman*.
5. Report of Committee on Prerequisite, R. W. Fleming, *Chairman*.
6. Report of Publicity Committee, Rowland Jones, *Chairman*.
7. Report of Grievance Committee, W. M. Hankins, *Chairman*.
8. Report of Committee on National Certificate, H. C. Christensen, *Chairman*.
9. Report of Committee on Minimum Standards of Technical Equipment, A. C. Tayler, *Chairman*.
10. Report of Committee on Pharmaceutical Jurisprudence, Roy B. Cook, *Chairman*.
11. Report of Committee on Code Matters, R. L. Swain, *Chairman*.
12. Report of Banquet Committee, Linn E. Jones, *Chairman*.

MONDAY, AUGUST 5, AT 6:30 P.M.—N. A. B. P. BANQUET.—ASSEMBLY HALL ROOM.

TUESDAY, AUGUST 6, AT 9:00 A.M.—JOINT SESSION.—ASSEMBLY HALL ROOM.

National Association of Boards of Pharmacy and American Association Colleges of Pharmacy—program to be announced later.

TUESDAY, AUGUST 6, 1:30 P.M.—FINAL SESSION.—ASSEMBLY HALL ROOM.

1. Reports of Vice-Presidents.
   District No. 1, George Moulton.
   District No. 2, John M. Woodside.
   District No. 4, Albert E. Ely.
   District No. 5, Wm. C. Muesing.
   District No. 6, Mac Childs.
   District No. 7, R. C. Shultz.
2. Report of Committee on President's Address.
3. Report of Department of Education, R. L. Swain, *Director*.
4. Report of Committee on Constitution and By-Laws, L. C. Lewis, *Chairman*.
5. Report of Resolutions Committee, A. C. Taylor, *Chairman*.
6. Report of Committee on Plaque, J. A. J. Funk, *Chairman*.
7. Reports of Special Committees.
8. Unfinished Business.
9. New Business.
10. Report of Nominating Committee.
11. Election and Installation of Officers.
12. Adjournment.

Thirty-Sixth Annual Meeting of the

AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY.

HOTEL MULTNOMAH, PORTLAND, OREGON, AUGUST 5–6, 1935.

OFFICERS.

President, Ernest Little; *Vice-President*, Antone O. Mickelsen; *Secretary-Treasurer*, Zada M. Cooper; *Chairman of the Executive Committee*, Charles B. Jordan.

MONDAY, AUGUST 5TH.

9:00 A.M. Meeting of Executive Committee—Empire Room.

9:30 A.M. Meetings of Teachers' Conference.

Conference of Teachers of Pharmacy, Monday, August 5th, 9:30 A.M.—Junior Ball Room.

OFFICERS.

Chairman, W. G. Crockett; *Vice-Chairman*, Leon W. Richards; *Secretary*, Emery T. Motley.

Program.

A Round Table Discussion of Pharmaceutical Technique as Described in the Syllabus.

Conference of Teachers of Chemistry, Monday, August 5th, 9:30 A.M.—Club Room.

OFFICERS.

Chairman, Marion L. Jacobs; *Secretary*, John C. Bauer.

Program.

1. Instruction about Synthetics, E. V. Lynn. Discussed by—George L. Webster and Glenn L. Jenkins.
2. The Teaching of Food and Drug Analysis, C. C. Glover. Discussed by—Russel A. Cain and Frederick Grill.

Conference of Teachers of Pharmacognosy and Pharmacology—Monday, August 5th, 9:30 A.M.—Colonial Room.

OFFICERS.

Chairman, A. John Schwarz; *Secretary*, Charles E. F. Mollett.

Program.

Topics for Discussion:

1. Pharmacology: Definition and Scope of the Course for Pharmacy Majors, Frank H. Eby and H. M. Burlage.
2. Should the Term Materia Medica Be Deleted from Our Catalogs and from State Board Examinations? C. E. Mollett.
3. Should Undergraduate Students in Pharmacy Do Animal Experimentation or Should the Course Be Taught by Demonstration? F. J. Bacon.
4. Biological Assays for Undergraduate Students in Pharmacy, D. B. R. Johnson.
5. Correlation of the Courses in Pharmacology and Physiology, Dr. Van Loan.
6. Pharmacology as a Basis for Improving Relations with Physicians, B. V. Christensen.
7. Suggestions for a Course in Botany for Pharmacy Students, H. M. Wilson and Ralph Bienfang.

Paper—"A Study of the Records of the Same Class in Botany and Pharmacognosy," Marin S. Dunn.

Conference of Teachers of Pharmaceutical Economics—Monday, August 5th, 9:30 A.M.—Marine Room.

OFFICERS.

Chairman, Paul C. Olsen; *Secretary*, John F. McCloskey.

Program.

Topics for Discussion:

Trends in drug store profits 1932, 1933 and 1934.

Accounting records necessary and desirable in drug stores.

The operation of state fair trade acts for resale price control.

SESSIONS OF THE ASSOCIATION.

First Session, Monday, August 5th, 1:30 P.M.—Junior Ball Room.

Roll Call.

Appointment of Committee on Resolutions.

Address of the President, Ernest Little.

Report of the Secretary-Treasurer, Zada M. Cooper.

Report of Executive Committee, Charles B. Jordan.

Appointment of the Nominating and Auditing Committees.

Paper—"The Four-Year Course in Pharmacy," C. O. Lee and H. G. DeKay.

Reports of Standing Committees:

Committee on Educational Standards, Edward Spease.

Committee on Curriculum and Teaching Methods, Robert C. Wilson.
Committee on Activities of Students and Alumni, George C. Schicks.
Delegates to the American Council on Education, Rufus A. Lyman.

MONDAY, AUGUST 5TH, 6:00 P.M.

Annual Dinner.
Address by Dean E. H. Lauer of the University of Washington.

Second Session, Monday, August 5th, 8:00 P.M.—Junior Ball Room.

Reports of Standing Committees (*Continued*):
Committee on Relation of Boards and Colleges, D. B. R. Johnson.
Committee on Libraries, Charles O. Lee.
Committee on Problems and Plans, Rufus A. Lyman.
Papers—"Objectives and Objective Tests."
For Qualitative Analysis, H. G. DeKay.
For Organic Chemistry, C. J. Klemme.
Syllabus Committee, J. G. Beard.
Paper: "The Teaching of Bacteriology to Pharmacy Students," George F. Reddish.
Reports of Special Committees.
Committee on Student Branches of the AMERICAN PHARMACEUTICAL ASSOCIATION, George L. Webster.
Committee on the Establishment of a Pharmaceutical Corps in the Unted States Army, Townes R. Leigh.
Committee to Study List of Crude Drugs Prepared by District No. 2, Heber W. Youngken.

Joint Session of the National Association of Boards of Pharmacy and the American Association of Colleges of Pharmacy, Tuesday, August 6th, 9:00 A.M.—Assembly Hall Room.

Report of the Fairchild Scholarship Committee, E. G. Eberle.
Paper—"The Possibilities and Limitations of Coöperation between Boards of Pharmacy and Colleges of Pharmacy," Robert P. Fischelis.
Report of Recommendations or Resolutions Referred from District Meetings, D. B. R. Johnson.

Third Session, Tuesday, August 6th, 2:00 P.M.—Junior Ball Room.

Reports of Special Committees (*Continued*):
Committee on Membership Standards, A. G. DuMez.
Committee on Code Matters, W. F. Rudd.
Committee on Food and Drug Legislation, Charles B. Jordan.
Report of Committee on Resolutions.
Reports of Special Representatives:
Representative on American Council on Pharmaceutical Education, A. G. DuMez.
Reporter on Biological Abstracts, Heber W. Youngken.
Representatives to National Conference on Pharmaceutical Research, Glenn L. Jenkins.
Representatives to National Drug Trade Conference.
Representatives to the Druggists' Research Bureau, Paul C. Olsen.
Representative to the National Association of Retail Druggists, John F. McCloskey.
Report of Historian, Edward Kremers.
Unfinished Business.
Miscellaneous.
New Business.
Executive Session.

Other programs under "Societies and Colleges."

SCIENTIFIC SECTION OF THE PROPRIETARY ASSOCIATION.

At the recent meeting of the Proprietary Association plans were formulated for work of the Scientific Section under direction of Dr. Geo. F. Reddish, assisted by Dr. Frederick J. Cullen. The foregoing will be assisted by a group of three scientists, to be appointed.

OFFICERS OF THE PROPRIETARY ASSOCIATION.

The election for officers of the Proprietary Association resulted in the unanimous returning of the retiring executives to office, as follows: *President*, Frank A. Blair, New York; *Honorary Vice-President*, Dr. V. Mott Pierce, Buffalo; *First Vice-President*, Henry F. Bristol, New York; *Second Vice-President*, E. K. Hyde, Buffalo; *Third Vice-President*, J. H. Howe, St. Louis; *Secretary-Treasurer*, Charles P. Tyrrell, Syracuse.

N. W. D. A. CONVENTION.

The sixty-first annual convention of the National Wholesale Druggists' Association will be held September 29th to October 3rd, at the Greenbrier Hotel, White Sulphur Springs, W. Va. R. C. Treseder is chairman of the arrangements and entertainment committee.

COMMITTEE REPORTS

COMMITTEE ON RESEARCH, AMERICAN PHARMACEUTICAL ASSOCIATION.

H. V. ARNY, CHAIRMAN.

The question of the 1935–1936 award from the A. PH. A. Research Fund has been given the careful consideration of the Research Committee, and, by mail ballot, it was decided that the grant of $1000.00 be devoted to *one special piece of research;* subject to be decided upon at the August meeting of the Research Committee during the A. PH. A. Convention in Portland, Oregon.

The fine work on drug extraction performed by Dr. W. J. Husa and his associates during the past three years and financed by grants from the A. PH. A. Research Fund encourages the Research Committee in the belief that another extended piece of worth-while research is desirable, and this notice is being published by way of an invitation to workers in the field of pharmaceutical research to suggest topics suitable for the creation of a research project to be financed from the A. PH. A. Research Fund.

All such suggestions (or applications) shall be laid before a special sub-committee consisting of Messrs. Cook, Gathercoal, Scoville, Beal and Arny who will make specific recommendations of the entire membership of the Research Committee at its Portland meeting. At that time, the Committee will decide upon the subject of the research project and the person to whom the task will be entrusted, and the recommendations of the Committee will then be transmitted to the A. PH. A. Council and to the General Session of the ASSOCIATION for final action.

Suggestions as to topics and requests for the grant should be sent to the *chairman* of the Research Committee, **H. V. Arny,** 115 W. 68th St., New York, N. Y., not later than July 10, 1935.

NATIONAL FORMULARY EXHIBIT AT THE AMERICAN MEDICAL ASSOCIATION CONVENTION.*

BY ADLEY B. NICHOLS.

As usual, the National Formulary held an exhibit in the Scientific Section, at the annual convention of the American Medical Association, convened this year at Atlantic City, N. J., during the week of June 10th.

In this year's exhibit advantage was taken of the fact that the new National Formulary will appear shortly. A number of the new items were featured, in an attempt to arouse interest and to have the physicians prepared and "up-to-date," as one of the cards announced.

Dr. Bernard Fantus, of Chicago, a member of the National Formulary Revision Committee, presented a paper before the association, in which he discussed many of the new National Formulary products, together with some of the old, and numerous items of related interest. Dr. Fantus' paper was used as a basis for the National Formulary exhibit.

The central section of the National Formulary booth was devoted to a half dozen interesting vehicles. The physician to-day desired to find out how to make his prescriptions as tasty as possible and he thoroughly appreciates whatever help he can obtain along this line. Vehicles have been shown repeatedly in these exhibits, and still continue to be a real drawing card. It must be remembered that since the American Medical Association meets in a different section each year, a great many of these in attendance come from the nearby territory and consequently even a repeated item is new to them.

The following preparations were included in the central section, Syrup of Acacia, which has been modified for the N. F. VI; Syrup of Cherry, a striking new vehicle, which received front page attention in the *Philadelphia Evening Bulletin* and *Associated Press News* dispatches; Syrup of Cinnamon and Syrup of Glycyrrhiza, both remodeled N. F. products, and Syrup of Raspberry, an old favorite which was shown again, because of its popularity.

One of the side wings was given to the presentation of the new Iso-alcoholic Elixir of the N. F. VI. This was well received and it is hoped that pharmacists will make themselves thor-

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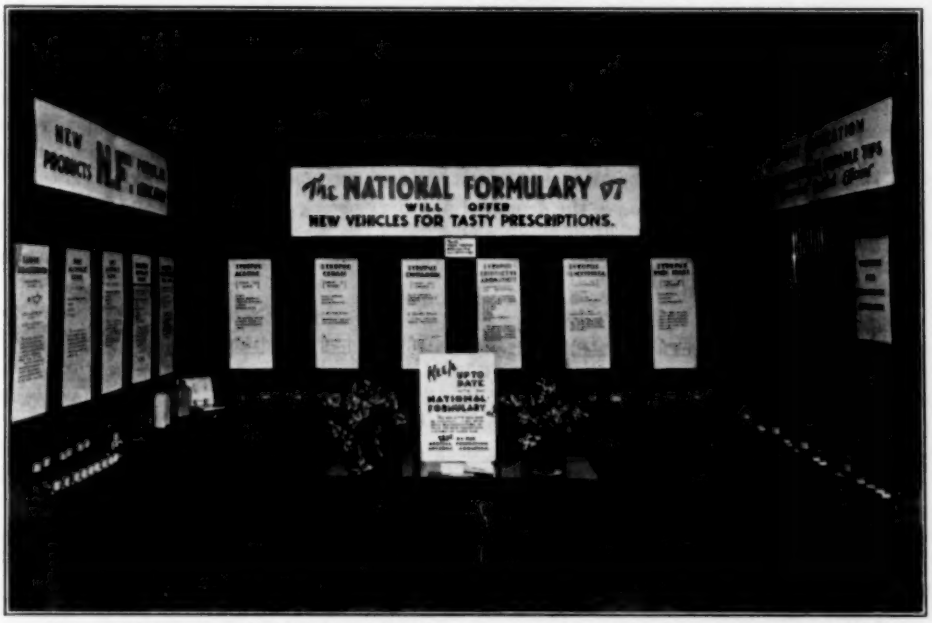
* Atlantic City, N. J., June 10–14, 1935.

oughly acquainted with the many possibilities of this preparation and be prepared to sponsor it when the N. F. VI appears. Emulsion of Cod Liver Oil with Egg and the New Emulsion of Liquid Petrolatum and Phenolphthalein were also shown on this side of the booth.



National Formulary Exhibit at A. M. A. convention, Atlantic City, June 10–14, 1935.

The other side carried a special display of assorted collapsible tubes and tips, together with ointments and jellies illustrating the specific uses of eye tips, nasal tips, rectal tips, etc. This display was based upon the paper by Dr. Fantus.

As usual, a booklet was prepared briefly covering the high spots of the exhibit and approximately fifteen hundred of these were distributed during the session.

LOCAL BRANCHES.

(*Continued from page 498.*)

CHICAGO.

The regular monthly meeting of the Chicago Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION was held on April 16th, at the University of Illinois College of pharmacy. The speaker of the evening was Dr. Paul N. Leech, secretary of the Council of Pharmacy and director of the American Medical Association Chemical Laboratory.

Dr. Leech discussed "Some Topics of Interest to the Pharmacist and Physician."

The discussion began with a review of the present Pure Food and Drugs Act and of the progress being made with the bill before Congress at the present time to strengthen the act.

Dr. Leech stated that so many changes were constantly being made with the present bill that it is absolutely impossible to keep up with the changes and presented the last revised copy of the bill that he had received and which had since been changed.

It was stated that the present bill was good for all of those except where the shoe did not fit and in most cases where it did not fit the objections were against the welfare of the public.

Dr. Leech stated that the present bill had been emasculated and that he hoped for a better bill than the present one as it stands before Congress. Certainly the present law is inadequate but maybe it would be better to amend it than to adopt the new one in its present condition.

Slides were shown and discussed showing the evolution of medicines during the past thirty years. This brought out the ease with which testimonials could be obtained from reliable doctors, then as compared to now.

Slides were shown giving a comparison of trade-marked drug prices as compared to similar U. S. P. and N. F. products. The price was unquestionably in favor of the official drugs.

Attention was drawn to the many super-advertised drugs on the market that are not what their names or description imply. Mention was made of many drugs that have been tested by the American Medical Association Laboratories that did not come up to standard. It was pointed out that we were not being led to believe that the entire drug trade was in this condition, but that only some of the "sore thumbs" had been discussed to show that there is need for a stricter supervision over those firms who do not have the welfare of the public at heart.

Dr. Leech made mention of the dearth of new drugs being discovered in America before the war and the rapid progress made in this country since the war. At first we began producing many new products of an organic extract nature, then synthetics and now the center of attention seems to be in the biologicals.

LAWRENCE TEMPLETON, *Secretary*.

NORTHERN NEW JERSEY.

The Northern New Jersey Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION held its second annual Physician's Night as its April meeting, on April 15th. Due to the development during the year of the New Jersey Formulary the greater part of the evening was devoted to a discussion of this important project. William Richert, of Elizabeth, addressed the physicians and pharmacists on the work from the viewpoint of the pharmacist and Dr. H. B. Wilson, of Hackensack, discussed the physician's views. The Formulary Committee made a display of the various preparations which thus far have been included in the formulary and following the meeting answered questions pertaining to the compounding and use of each product.

Dr. Hans Molitor, director of the Merck Institute of Therapeutic Research, addressed the meeting on the subject, "Therapeutic Research and Its Relation to Pharmacy, Medicine and Chemistry," in which he explained the objects of research in developing new drugs, justifying the use of old drugs, and in developing new uses for old drugs.

The May meeting of the Branch will take the form of a testimonial dinner to Dean Ernest Little in recognition of his services to the profession as president of the American Association of Colleges of Pharmacy. The dinner will be held at the Hotel Robert Treat, Newark, on Monday night, May 20th, at seven o'clock.

The officers of the Branch are: *President*, George C. Schicks; *Vice-President*, Robert W. Rodman; *Secretary*, C. L. Cox; *Treasurer*, A. F. Marquier.

C. L. COX, *Secretary*.

PHILADELPHIA.

The April meeting of the Philadelphia Branch, AMERICAN PHARMACEUTICAL ASSOCIATION was held in the Temple University, Medical School, Broad and Ontario Streets on April 16, 1935.

President MacLaughlin called the meeting to order at 8:30 P.M. The minutes of the March meeting were read and approved as read.

Upon a motion by Dr. Munch, seconded by Ambrose Hunsberger, Dr. A. T. Pollard was elected to Honorary Life membership in the Philadelphia Branch.

President MacLaughlin appointed the following committees:

Committee on Professional Relations: H. Evert Kendig, *Chairman;* Dr. Wilmer Krusen, Charles H. LaWall.

Committee on Practical Pharmacy: Ambrose Hunsberger, *Chairman;* Quintus Hoch, Charles T. Pickett.

Committee on Membership: Dr. James C. Munch, *Chairman;* Alfred Barol, Frank H. Eby, Geo. K. Schacterle, Harvey P. Frank, William J. Stoneback.

Committee on Entertainment: Adley B. Nichols.

The speaker of the evening, Prof. Marvin R. Thompson of the School of Pharmacy, University of Maryland, was then introduced. His topic was "Recent Developments in the Pharmacology and Therapeutics of Ergot." After a brief historical sketch on the introduction of Ergot

into medical practice, the speaker outlined the constituents found in the drug. He summarized, most masterfully, the amino-bases and specific alkaloids found in Ergot and discussed the pharmacodynamics of each. He stated that pharmacologically and clinically Ergostetrine proved to be the most active of the alkaloids. The alkaloid "Ergostetrine" discovered and isolated by Prof. Thompson was discussed in detail.

In discussing the U. S. P. X Cock's Comb Test, Prof. Thompson stated that it seemed to be the most satisfactory test known at the present time, but also he said, that in a sample of Ergot showing a 100% pharmacological activity; 75% of the activity was due to all the Ergot alkaloids and 25% of the activity was due to ergostetrine, whereas clinically 75% of the activity was due to ergostetrine and only 25% of the activity was due to the other alkaloids.

Prof. Thompson was greatly in favor of the use of aqueous or hydro-alcoholic extracts of the drug rather than its specific alkaloids

After a general discussion of the subject a rising vote of thanks was given the speaker for his most interesting lecture.

GEORGE E. BYERS, *Secretary*.

NEW JERSEY INTENDS TO MAKE "PRACTICAL EXPERIENCE" MEAN SOMETHING.

BY ROBERT P. FISCHELIS.

The new New Jersey law which deals with practical experience was signed by the Governor on May 31st, and becomes effective July 1, 1936. The following is taken from a statement made by the secretary of the Board of Pharmacy of the State of New Jersey, Robert P. Fischelis.

"The new legislation provides:

"1. That the applicant shall have not less than four years of practical experience obtained in accordance with the rules and regulations of the Board of Pharmacy under a Registered Pharmacist in a registered pharmacy where prescriptions of medical practitioners are compounded and drugs are sold at retail, and which registered pharmacy is approved by the Board of Pharmacy for such purpose.

"2. A credit of not more than three years may be given in lieu of store experience for an equal time spent in a course of study and laboratory instruction in a school of pharmacy approved by the Board of Pharmacy.

"3. The Board of Pharmacy is authorized to conduct written examinations in the theoretical subjects for applications for registration at any time after the applicant has been graduated from an approved college of pharmacy.

"4. No candidate shall be examined in practical pharmacy and laboratory work until he has met all of the requirements for registration provided in the law and rules of the Board, and such requirements shall include one year of practical experience served under the supervision of a Registered Pharmacist *subsequent* to graduation from an approved college of pharmacy, in a pharmacy approved by the Board for such purpose.

"5. The successful passing of the examination in theoretical subjects confers no rights or privileges upon the applicant in connection with the practice of pharmacy in the State of New Jersey.

"Rules and regulations for the enforcement of the new experience requirement have not been made, but they will be made with great care and will be announced in due course. It is important for future applicants in New Jersey to note that until July 1, 1936, the present requirements of four years of practical experience with an allowance not to exceed two calendar years for work completed in an approved college of pharmacy, will remain in effect. Applicants who take the examination after July 1, 1936, will be permitted to qualify for the theoretical tests immediately after graduation. They may acquire as much practical experience as they desire before or during their college course, but in every instance they must present, in addition, one full calendar year of experience obtained in accordance with the rules of the Board in a pharmacy approved for practical experience by the Board.

"It is self-evident that every type of drug store or pharmacy in existence under the laws of the state is not a satisfactory place for acquiring practical experience. The determining factors which will qualify stores as satisfactory places for acquiring practical experience will be announced in due course."

OKLAHOMA HEALTH EDUCATION.

The Oklahoma Pharmaceutical Association's program seeks to coöperate with the State Medical Society. It plans health education and coördinates pharmaceutical merchandising.

EDITORIAL NOTES

THE 1935 CONGRESS OF PHARMACY.

Dr. J. J. Hofman, president of the International Pharmaceutical Federation, has expressed the hope that the Federation will be able to count on a large attendance. This, indeed, seems probable, since side by side with this assembly there will be held a few days later an International Congress of Pharmacy, in which not only the members of the Federation will be able to participate, but every pharmacist and indeed every person interested in pharmacy whether as a science or as a profession. The general assembly of the International Pharmaceutical Federation will be held on July 29th and 30th, and the International Congress from July 30th to August 6th.

ANNUAL REPORT FOR 1934 OF CENTRAL NARCOTICS INTELLIGENCE BUREAU, EGYPTIAN GOVERNMENT.

The reports of the Central Narcotics Intelligence Bureau speak for careful study of the important subject of narcotic addiction and the efforts made to correct the conditions. Evidently, from the report, drug addiction has been reduced. The number of arrests, the methods of smuggling and the kinds of narcotics used by addicts are carefully reported; specific cases are detailed as to the evidence for conviction and the punishments assessed. The narcotics reported on differ in the several tables; most of them include cocaine, morphine, heroine, opium, hashish, manzoul and "other narcotics;" Manzoul consists of a mixture of hashish, dry spices and herbs and under "other narcotics" there are various mixtures with chocolate. Other lists report on the occupations represented, ages, nationalities, etc.

Chapter IV is entitled "A New Plague in Egypt" and the name is "Black Tea." It can never be foretold what may become an addiction and affliction, and therefore—because the use of tea seems now to be extensively misused, whereas before the war the use was limited and not in the manner which makes it more or less of a menace—reference is made. The reporter admits of the probable usefulness of tea as a beverage when properly prepared, but the harm is in the concentrated decoction from tea leaves or tea dust boiled in the water, and reboiled with further additions of tea, adding more tea leaves and water from time to time. This produces a heavy brown, bitter mixture which through its constricting and irritating properties is deleterious, producing indigestion and aggravating disorders such as ulcers and hyperacidity, septic absorption and the nervous effects of toxic infection. Additions are made of powdered nutmeg, date palm, etc., but the concentrated tea is the basis of the beverage and the ill-effects; the tea drinker eventually prefers the beverage to food.

MEMBERSHIP PRIZES IN THE A. PH. A.

Massachusetts College of Pharmacy through members of the faculty has presented as prizes the following memberships in the AMERICAN PHARMACEUTICAL ASSOCIATION:

Arthur M. Thompson, Organic Chemistry Award, offered by Treasurer Gammon; Nicholas Kafalas, Materia Medica, awarded by President Glover; Richard C. O'Leary, Pharmacy Prize, offered by Professor LaPierre; Commercial Pharmacy, Walter J. Luscinski, awarded by Vice-President Ellis; Analytical Chemistry, awarded to Elie J. Hudon, offered by Dean Theodore Bradley.

Recommendation to membership in and one year's dues to the AMERICAN PHARMACEUTICAL ASSOCIATION has been awarded to several students at the College of Pharmacy of the State University of Iowa for high scholarship.

Dean Teeters' prize for excellence in pharmacognosy was won by John X. Power, '35, Newton, Iowa.

Professor Cooper's prize to the highest ranking student in manufacturing pharmacy was awarded to William B. Day, '36, Davenport, Iowa.

Nicholas W. Solonen won the Scherling prize for highest rank in organic chemistry. This prize is given by Mrs. Scherling of Sioux City in memory of her husband.[1] Mr. Solonen also won Professor Kuever's prize for excellence in operative pharmacy. This prize is one year's subscription to the JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.

PERSONAL AND NEWS ITEMS.

Industrial and Engineering Chemistry celebrated the 65th birthday of Prof. Reid Hunt, former president of U. S. Pharmacopœial Convention.

[1] Member, A. PH. A. from 1884 until his demise in 1933.

Pharmacists from all parts of the state gathered May 13th, in the Connecticut College of Pharmacy, to take part in ceremonies centered about the unveiling and presentation of a steel engraving of the late P. J. Garvin to the college. The ceremonies were simple and proved very impressive, with **Miss Alice-Esther Garvin,** daughter of the late Mr. Garvin, unveiling the engraving. Among the speakers were: Thomas E. Nugent, William J. Coughlan, Hugh P. Beirne and Curt P. Wimmer. Dean Henry S. Johnson accepted the engraving in behalf of the college.

Our honorary member, **William Mair,** contributed an article in the May 18, 1935, issue of the *Chemist and Druggist* relating to the A. PH. A., the Stabler-Leadbeater Apothecary Shop and the conditions in American pharmacy.

George P. Forrester, of the *Chemist and Druggist,* has discontinued editorship of the *Chemist and Druggist* and is taking up an appointment with the Imperial Chemical Industries.

Dr. Wm. F. Notz, dean of the Georgetown University School of Foreign Service, and internationally known economist, died June 4th, at his residence in Washington. Dr. Notz was the son of Dr. F. W. A. Notz, a pioneer Wisconsin educator, Northwestern College, Watertown, Wis.

Harold Hutchins has been named managing editor of the *American Druggist.*

Frater Affleck will entertain the Veteran Druggists and their wives at Deep Cove, Md., on July 2nd.

Walter S. Nicklin, Jr., son of our esteemed member in Alexandria, won the Henry E. Kalusowski prize, presented by District of Columbia Pharmaceutical Association through George Washington University School of Pharmacy for highest proficiency in pharmacy. Another prize-winner is F. Royce Franzoni.

At the Commencement of the University of Pittsburgh on June 5th, the honorary degree of "Doctor of Science" was conferred on **William A. Hamor,** assistant director of Mellon Institute of Industrial Research.

Mrs. L. S. Williams, Baltimore, has presented a copy of Boerhaave's Materia Medica—a series of prescriptions—London, 1741.

Mrs. Mary E. Apple (Franklin M.) has donated a volume "Chemical Amusement, a Series of Curious and Instructive Experiments in Chemistry," by Frederick Accum, London, 1818.

Dean Charles H. LaWall, of the Philadelphia College of Pharmacy and Science, will sail on July 3rd, for Copenhagen to attend a meeting of the Committee upon Uniform Method of Opium Assay, which has been working under the auspices of the Health Committee of the League of Nations since 1931. The chairman of the committee is Dr. L. Van Itallie, of the University of Leiden. Other members are Dr. Yasuhiko Asahina, of Tokio; Dr. H. T. Baggesgaard-Rasmussen, of Copenhagen; Professor R. Eder, of Zurich; Dr. A. Goris, of Paris; Dr. A. W. K. De Jong, of Medan, Netherlands; Professor Erich Knaffi-Lenz, of Vienna, and J. R. Nicholls, of London. Dr. LaWall is representing the U. S. Treasury Department as a pharmaceutical chemist assigned to this special research.—*Science.*

Dean LaWall will represent the American Pharmaceutical Association at the International Pharmaceutical Federation and at the Congress of Pharmacy, meeting at Brussels.

President Joseph Sweetman Ames, of Johns Hopkins University, severed his connection with the university at the fifty-ninth commencement exercises, after 51 years as a member of the faculty, the last six as head of the institution. Isaiah Bowman was announced as Dr. Ames' successor.

The Philadelphia College of Pharmacy and Science conferred the honorary degree of "Master of Pharmacy" on the following: **Eli Lilly,** Indianapolis; **Dr. Wm. A. Pearson,** Philadelphia; **John M. Woodside,** Philadelphia.

Prince Malaku Emmanuel Bayen, of Abyssinia, earned the degree of "Doctor of Medicine" at Howard University, Washington. He is a nephew of Emperor Haile Selassie. The Prince enrolled as a member of the Medical School several years ago.

Dr. Paul Nicholas Leech, secretary of the Council on Pharmacy and Chemistry visited the American Institute of Pharmacy on his return trip from the meeting of the American Medical Association. **Pharmacist Generoso Velasquez** of the Philippine General Hospital; Dr. José E. Jimenez, chairman of the Board of Pharmaceutical Examiners and Inspectors; Vice-President of Colegio Medico-Farmaceutico de Filipinas; Vice-President of Philippine Pharmaceutical Association and owner of Farmacia San Fernando in Manila, were among recent visitors; also Walton A. Hill of Veterans Hospital, Tuscaloosa, and John A. Purinton, Jr., Detroit, Mich.

Prof. Harold W. Werner will continue research in chemotherapy in the Department

of Pharmacology of the University of Wisconsin.

HUGO DE VRIES.

Hugo de Vries, world-famous botanist, died May 21st, at his home near Arnheim, Holland, aged 87 years.

Professor de Vries was born at Haarlem in 1848. He earned his degree in natural science at Leyden in 1870, and continued his studies at Würzberg and Heidelberg, specializing in botany and also studied chemistry. He was appointed to the University of Amsterdam in 1878 and a lecturer at Halle. His great work was done in connection with the development of the theory of mutation as a method of evolution, and it was along these lines of study and research that De Vries earned his place as a leading world scientist.

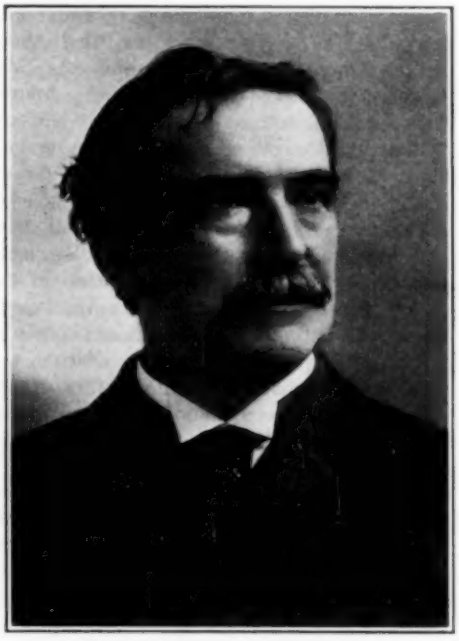
He published "Intracellular Pangenesis" in 1889, in which he differed from Darwin; "The Mutation Theory" appeared in 1901, "Plant Breeding" in 1907, and other works followed. For about forty years Professor De Vries was director of the Amsterdam Botanical Gardens and member of the faculty of the University of Amsterdam; after his retirement he issued a collection of his writings, which had been separately published or contributed to scientific publications. He declined invitations to faculties of other universities.

ENCOURAGING THE USE OF NARCOTICS.

A special correspondent of the *New York Times* reports that "inside the city of Changli there is only one shop that sells narcotics, but outside the city walls there are thirty-six shops, of which twenty-two are owned by Japanese and fourteen by Koreans, selling heroine, morphine and opium quite openly. Throughout the county of Changli there are 163 shops selling these narcotics to Chinese of the demilitarized zone. The first time a customer enters one of these shops he is charged five cents for his purchase. The price rises as the customer becomes addicted."

DOHME PORTRAIT PRESENTATION.

The oil portrait of the late Charles E. Dohme, president of the AMERICAN PHARMACEUTICAL ASSOCIATION, 1898–1899; formerly president of the Maryland College of Pharmacy, the forerunner of the School of Pharmacy, University of Maryland, which was given to the institution last October by Dr. A. R. L. Dohme, was officially presented to the school May 31st. Other speakers were Dr. D. M. R. Culbreth, Dr. Thomas S. Cullen and Charles C. Neal, of Sharp & Dohme.



CHARLES E. DOHME.

Dr. A. G. DuMez, dean of the school, acted as master of ceremonies. The portrait was accepted by Dr. Raymond A. Pearson, president of the University of Maryland.

"THE CULTURE OF WHOLE ORGANS."

The above is the title of a paper by Dr. Alexis Carrel and Charles A. Lindbergh which was received as most important research, whereby the means may be afforded for seeing the process of making the hormones and witness the results of their productions and, also, how organs succumb to disease.

We are very willing to honor Dr. Carrel for the valuable contributions he has made to medical science, but the participation of Colonel Lindbergh in discoveries add greatly to medical science and are beyond estimation, they speak for his observations and application of them.

The article referred to describes a new method by which "an organ can be taken out of the body of an animal and kept alive for study under glass, the chemical equivalent of a blood stream being supplied by an arti-

ficial heart. The organs were handled by Dr. Carrel, the mechanical heart was constructed by Colonel Lindbergh."

In 1931, the latter designed a rotating coil of glass to substitute for the heart as a blood pump; he is credited with inventing a spore-catcher, which he attached to his plane to ascertain how much vegetable life exists in the upper stratums.

SOCIETIES AND COLLEGES.

CANADA PHARMACEUTICAL ASSOCIATION.

Canada Pharmaceutical Association will meet in Victoria B. C., August 5th–8th; the AMERICAN PHARMACEUTICAL ASSOCIATION will convene in Portland, Oregon, August 5th–10th. The two associations meet in the same section and this offers an opportunity for interchange of visitations.

SECTIONS AND CONFERENCES. PAPERS AT THE PORTLAND MEETING OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.

The list of officers may be found in the roster; for your convenience the names of the presiding officers and secretaries are here given: **Scientific Section,** *Chairman,* E. V. Lynn, Massachusetts College of Pharmacy, Boston; *Secretary,* F. E. Bibbins, 5840 Washington Blvd., Indianapolis, Ind. **Section on Education and Legislation,** *Chairman,* Oscar E. Russell, 531 So. Main St., Elkhart, Ind.; *Secretary,* L. W. Rising, University of Washington, Seattle, Wash. **Section on Practical Pharmacy and Dispensing,** *Chairman,* H. M. Burlage, University of North Carolina, Chapel Hill, N. C.; *Secretary,* Leon W. Richards, University of Montana, Missoula, Mont. **Section on Commercial Interests,** *Chairman,* Henry Brown, Scranton, Pa.; *Secretary,* R. T. Lakey, Cass & Hancock Aves., Detroit, Mich. **Section on Historical Pharmacy,** *Chairman,* C. O. Lee, Purdue University, La Fayette, Ind.; *Secretary,* H. W. Youngken, Massachusetts College of Pharmacy, Boston, Mass.; *Historian,* E. G. Eberle, 2215 Constitution Ave., Washington, D. C.

National Conference on Pharmaceutical Research, *Chairman,* E. N. Gathercoal, 710 So. Wood St., Chicago, Ill.; *Secretary* John C. Krantz, Jr., 2411 No. Charles St., Baltimore, Md. **Conference of Pharmaceutical Association Secretaries,** *President,* F. V. McCullough, New Albany, Ind.; *Secretary,* Carl G A. Harring, 20 Glen Road, Newton Center, Mass. **Conference Pharmaceutical Law Enforcement Officials,** *Chairman,* R. L. Swain, 2411 No. Charles St., Baltimore, Md.; *Secretary,* M. N. Ford, New State Office Building, Columbus, Ohio. **Plant Science Seminar,** *Chairman,* Frank H. Eby, 240 Powell Road, Springfield, Pa.; *Secretary,* F. J. Bacon, Western Reserve University, Cleveland, Ohio.

American Association of Colleges of Pharmacy, *President,* Ernest Little, Rutgers University College of Pharmacy, Newark, N. J.; *Secretary,* Zada M. Cooper, University of Iowa, College of Pharmacy, Iowa City, Ia.; *Chairman of Executive Committee,* C. B. Jordan, Purdue University, La Fayette, Ind.

National Association of Boards of Pharmacy, *President,* C. H. Evans, Warrenton, Ga.; *Secretary,* H. C. Christensen, 130 No. Wells St., Chicago, Ill.

PROGRAM OF NATIONAL CONFERENCE ON PHARMACEUTICAL RESEARCH, 1935 MEETING.

PORTLAND, OREGON, SATURDAY, AUGUST 3, HOTEL MULTNOMAH.

First Session 2:00 P. M.

1. Call to Order by Chairman.
2. Appointment of Nominating Committee.
3. Summary of Year's Activities and Outlook of Conference for the Future, by Chairman Gathercoal.
4. Reports of Officers.
   a. Report of Secretary.
   b. Report of Treasurer.
   c. Report of Executive Committee by Secretary.
5. Reports of Standing Committees.
   (1) Physical Chemistry, Arthur Osol, *Chairman.*
   (2) Bacteriology and Immunology, Louis Gershenfeld, *Chairman.*
   (3) Pharmacognosy, Heber W. Youngken, *Chairman.*
   (4) Pharmacology and Bioassays, James C. Munch, *Chairman.*

6. Roll Call of Delegates.
7. Adjournment for dinner. Arrangements will be made for a dinner for the delegates assembled.

An address pertinent to the work of the Conference will be delivered.

Evening Session 8:00 P. M.

8. (5) Medicinal Chemicals, Joseph Rosin, *Chairman.*
   (6) Endocrinology, Arthur Grollman, *Chairman.*
   (7) Manufacturing Pharmacy, L. Wait Rising, *Chairman.*
   (8) Pharmaceutical Dispensing, William J. Husa, *Chairman.*
   (9) Educational Methods, A. B. Lemon, *Chairman.*
   (10) Pharmaceutical Economics, Harry S. Noel, *Chairman.*
   (11) Historical Pharmacy, Charles H. LaWall, *Chairman.*
9. Reports of Other Special Committees.
   (1) Publications, Edward N. Gathercoal, *Chairman.*
   (2) Census of Research, James C. Munch, *Chairman.*
10. General Discussion of the Status of Pharmaceutical Research.
11. Election and Installation of Officers.
12. Adjournment.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The pharmacy program of the American Association for the Advancement of Science is printed in the April JOURNAL A. PH. A., page 338. The pharmaceutical organizations of Australia and New Zealand join in the program of the Association for the Advancement of Science of these countries in Section O Pharmaceutical Science. The program in Minneapolis, on June 27th, was part of Section N (Medical Sciences) and Section N3 (Pharmacy).

AMERICAN MEDICAL ASSOCIATION.

The house of delegates of the American Medical Association, at its annual meeting in Atlantic City, adopted a resolution which would make the Association a monitor of all radio broadcasting on the subject of medicine heard by the American people, regardless of whether the broadcasts originate in this country or in foreign nations.

Opposition to the Copeland pure food bill was expressed in two resolutions. They were referred to committees.

After four successive years of evading the issue, the Association officially recognized the problem of birth control.

A resolution was adopted, providing for the appointment of a special committee by the board of trustees, to study the problem of birth control during the next year and present at least a preliminary report on it at the annual meeting of the house of delegates of the Association in 1936.

A preamble to the carefully worded resolution stated that nothing in it was to be interpreted as "a declaration of action either for or against birth control."

OFFICERS OF AMERICAN PHARMACEUTICAL MANUFACTURERS' ASSOCIATION.

The following officers of the American Pharmaceutical Manufacturers' Association were unanimously elected:

President, George R. Flint, Decatur, Ill.; *First Vice-President*, Carroll Dunham Smith, Orange, N. J.; *Second Vice-President*, J. C. Fausnaught, Worcester, Mass.; *Secretary*, C. W. Warner, Newark, N. J.; *Treasurer*, Frank A. Mallett, Des Moines, Iowa; *Members of Board of Directors*, three-year forms, Carl N. Angst, Indianapolis; Eliot Frosst, Montreal, Quebec; and R. Lincoln McNeil, Philadelphia; two-year term (to fill vacancies), R. L. Maltbie, Newark, N. J., and E. T. Kirkland, Decatur, Ill.

DAIRY, FOOD AND DRUG OFFICIALS MEET.

The Central Atlantic States Dairy, Food and Drug Officials held their 19th annual convention at the John Marshall Hotel in Richmond on May 14th and 15th. The meeting was well attended and was presided over by Major W. Catesby Jones of the Chemistry Division of the Virginia Department of Agriculture. The gathering was addressed by Governor Peery and by Mayor Bright of Richmond and a number of interesting addresses were delivered by members in attendance. These dealt with foods, seeds, fertilizers, seafood, insecticides, drugs and cosmetics. President R. P Fischelis, of the AMERICAN PHARMACEUTICAL ASSOCIATION delivered an address on Drug Control by the States.

The following resolution was presented and adopted:

WHEREAS the 19th Annual Conference of the Central Atlantic States Association of Dairy, Food and Drug Officials held at Richmond, Va., on May 14 and 15, 1935, has been one of the most pleasant and inspiring in the entire experience of the Association, and

WHEREAS at this time our thoughts turn to those who in various ways participated to make our Conference successful,

Be It Resolved that this Association extend in this manner their appreciation to Dr. Robert P. Fischelis for the excellent paper on "Regulations of the Manufacture and Distribution of Drugs and Medicines in the Interest of the Consumer" presented by him, and

Be It Further Resolved that a copy of this resolution be spread upon the Minutes of the 19th Annual Meeting of the Association and a copy be forwarded to Dr. Robert P. Fischelis.

ANDREW J. KROG, *Chairman*,
Resolution Committee.

F. L. WOLLARD,
W. BROWNLEY FOSTER, M.D.

ALABAMA.

Dr. James S. M. Lester, president of the American Medical Association, Dr. L. S. Blake, head of the Pharmacy Department, Alabama Polytechnic Institute, and Dr. A. R. Bliss, Jr., were among the speakers at Alabama Pharmaceutical Association, held in Birmingham, June 19th–20th.

ILLINOIS.

Among the speakers of the Illinois convention at Quincy were: E. F. Kelly, Samuel C. Henry, Samuel Shikolnik, Carl Weeks. The following officers were elected: *President*, Howard H. Zorn, Springfield; *First Vice-President*, Edward J. Merriman, Joliet; *Second Vice-President*, Joseph Allegrette, Chicago; *Third Vice-President*, W. E. Brown, Quincy; *Secretary*, William B. Day, Chicago; *Treasurer*, A. W. Reinhardt, Rockford.

LOUISIANA.

Endorsement was given to a fair trade act, to be introduced in the next legislature. The following officers were elected: *President*, A. J. Bourdreaux, Opelousas; *Vice-Presidents*, Joseph Clesy, New Orleans; M. Kirtley, Washington; Henry Richardson, Shreveport, Eugene Voght, Ferriday; John E. Guess, Hammond; Roy Bridges, Alexandria; *Recording Secretary*, Joseph H. Berner, New Orleans; *Corresponding Secretary*, Paul Weilbacher, New Orleans; *Treasurer*, Elmo D. Ciro, New Orleans.

TEXAS.

Texas Pharmaceutical Association elected the following officers:

President, C. C. Harris, Houston; *First Vice-President*, B. B. Brown, Dallas; *Second Vice-President*, Festus A. Pierce, Corsicana; *Secretary-Treasurer*, W. J. Danforth, Fort Worth. *Members of the Executive Committee:* Henry F. Hein, San Antonio; E. B. Oliver, Longview; Shine Phillips, Big Spring; Murray Thames, Beaumont; Roy Pool, Amarillo.

Secretary Walter D. Adams was elected editor of *Texas Druggist* and the publication was changed from a quarterly to a monthly.

Among the speakers of the convention were Charles E. Turner, Mayor of Dallas for a number of terms and a former druggist, now finance director for the Texas Centennial Central Exposition; Representative R. L. Reader, H. L. Chichester, Macon, Ga., N. A. R. D. vice-president, and Tom Roach of Oklahoma City.

The Veteran Druggists' Association held its annual session, presided over by President A. H. Seely.

WEST VIRGINIA.

West Virginia Pharmaceutical Association held its annual meeting at Parkersburg, June 17th and 18th. Among the speakers scheduled were R. L. Swain, John Dargavel and State Senator G. O. Young.

FLORIDA.

The Florida Pharmaceutical Association was successful in point of attendance and program. A feature of the convention was the University Hour and tribute to Dr. James H. Beal.

The following officers were elected: *President*, Victor Wray, Haines City; *First Vice-President*, George Taylor, Miami Beach; *Second Vice-President*, George H. Grommet, Miami; *Third Vice-President*, R. L. Gaddy, Tallahassee; *Secretary-Manager*, Max S. Adler, Tampa: *Place of Meeting*, West Palm Beach. Time, 1936.

A speaker of the convention was **Dr. Robert C. Wilson,** dean of the School of Pharmacy, University of Georgia, on the subject of "The Sale of Drugs in Drug Stores." Other speakers were Drs. P. A. Foote, Townes R. Leigh, C. G. Hamilton and B. V. Christensen.

The words of tribute honoring Dr. James H. Beal were delivered by H. C. Shuptrine, a former president of the N. A. R. D. An honorary life membership in the Florida Pharmaceutical Association and a beautiful desk set were presented to the honored guest who responded in expressions of appreciation and gratitude.

GEORGIA.

The following officers were elected by Georgia Pharmaceutical Association:

President, R. Lee Olive, Augusta; *First Vice-President,* H. S. Peters, Manchester; *Second Vice-President,* J. W. Brinson, Wrightsville; *Third Vice-President,* W. W. Fincher, Canton; *Secretary-Treasurer,* Z. O. Moore, Atlanta. Macon was selected as the convention city in 1936.

A resolution was passed expressing regret because of the absence of W. S. Elkin, Jr.

H. S. Noel and John W. Dargavel were among the speakers of the convention.

Expression of appreciation was given to the AMERICAN PHARMACEUTICAL ASSOCIATION and Secretary E. F. Kelly, for their part in the National Drug Trade Code; also, to Secretary John W. Dargavel who was present at the meeting and appreciation was expressed because of the service rendered by that organization.

NORTH CAROLINA.

Dr. Howard E. Rondthaler, President of Salem College, Winston-Salem, was one of the principal speakers at the annual meeting of North Carolina Pharmaceutical Association. His address was well received and devoted largely to the interests of North Carolina and neighbor states. Tribute was paid to F. W. Hancock, veteran Oxford druggist, who has attended fifty-four out of the fifty-six conventions of North Carolina Pharmaceutical Association. W. C. Porter, an uncle of O. Henry, made a brief address. The following officers were elected:

President, R. A. McDuffie, Greensboro; *First Vice-President,* W. C. Ferrell, Nashville; *Second Vice-President,* E. C. Adams, Gastonia; *Third Vice-President,* R. P. Rogers, Durham; *Secretary-Treasurer,* J. G. Beard, Chapel Hill; *Members of the Executive Committee:* J. C. Hood, Kinston; I. W. Rose, Chapel Hill; E. E. Thomas, Roxboro.

SOUTH CAROLINA.

Timely addresses were features of the South Carolina convention. Among the speakers of the convention were H. S. Noel, D. W. Daniel of Clemson College, and J. H. Landess of Memphis.

The following officers were elected for the ensuing year: *President,* V. F. Platt, Conway; *First Vice-President,* L. A. Melchers, Jr., Charleston; *Second Vice-President,* P. C. McCollum, Clemson College; *Third Vice-President,* T. H. Turner, Columbia; *Secretary-Treasurer,* J. M. Plaxco, Due West.

Myrtle Beach was chosen for the convention city in 1936.

(*To be continued.*)

NATIONAL DRUG CODE AUTHORITY.

The former members of the National Drug Code Authority met June 8th, for the purpose of taking steps to wind up the affairs of that organization. There were present: J. A. Goode, Wheeler Sammons, J. W. Dargavel and E. F. Kelly. The accounts of the organization were submitted for proper audit.

The files, records and papers of the Authority were turned over to Secretary E. F. Kelly for a period of one year and then to the American Institute of Pharmacy for such historical use as can be made of them.

Liberty is taken in quoting from *Drug Topics,* of June 10th, by R. L. Swain.

"(NRA) has made a lasting contribution to decent business and public morals. The codes, imperfect as they were, recognized the necessity of team-work and coöperation. Business has learned that good wages, humane hours and fair attitude toward competitors are not only attainable but highly desirable. NRA has added vastly to the heart and soul of business as a whole. It has been a boon to retail pharmacy.

"What are the facts? First of all, the code recognized the need for price stabilization in the drug field. The cost definition was the very principle which decent business fought for in the Capper-Kelly Bill, and it is the identical principle underlying the Fair Trade acts. This open recognition on the part of the government is a priceless gain.

"Then, too, the code proved that reasonable price regulation is in the interest of the consumer. Drug products declined in price under the code. A legitimate profit can be made without adding to the cost of living and is beneficial to all. The cost definition is complete proof that price stabilization is sound business practice."

The wholesale group, on December 6th, conferred with the Federal Trade Commission for the purpose of studying practices that are the major causes of unfair and unethical competition. (See December JOURNAL, 1934, page 1252.) Reference is made because the discussion emphasized principles that are basic in fair practice.

UNIVERSITY OF MARYLAND SCHOOL OF PHARMACY.

The following completed their work in the Graduate School of the University of Maryland and were awarded the Doctor of Philosophy degree: Samuel W. Golstein, L. Lavan Manchey, Emanuel Veritus Shulman and Frank J. Slama. They have been members of the teaching staff of the School of Pharmacy.

Two former graduates of the School of Pharmacy were honor men in the School of Medicine—George Frederick Schmitt, Jr., received the University Prize Gold Medal; Edward Francis Cotter received the second Certificate of Honor and the Dr. A. Bradley Gaither Memorial Prize for the best work in genito-urinary surgery during the senior year. Fourteen other members of the graduating class of the School of Medicine were graduate pharmacists. The Master of Science degree was conferred on Charles F. Brueing and Louis L. Sherman, who completed the major part of their work in the School of Pharmacy. Governor Nice of Maryland was the principal speaker at the commencement exercises of the University. The degree of Doctor of Laws was conferred on the Governor.

A large bequest to the University of Maryland Medical School was made in the will of the late Dr. Frank P. Bressler of Baltimore. The sum is estimated at considerably over $1,000,000.00.

DUQUESNE UNIVERSITY.

Dr. H. V. Arny, dean of the College of Pharmacy of Columbia University, was guest speaker at Duquesne University School of Pharmacy. The subject of his address was entitled "Five Times Ten Years in Pharmacy," in which he gave a short résumé of the personalities and the work of former presidents of the AMERICAN PHARMACEUTICAL ASSOCIATION and a pithy exposition of true professional pharmacy as it is, as it can be and as it should be in the days that are to come.

An oil painting of Dean Hugh C. Muldoon was presented by the students and graduates and accepted by President Callahan.

CORVALLIS SCHOOL OF PHARMACY.

Oregon State Daily Barometer, of May 24th, devotes the greater part of a page to the School of Pharmacy, its dean, faculty and activities.

TEMPLE UNIVERSITY.

Temple University, Philadelphia, has announced the establishment of a biological field station at Quaker Bridge, N. J., for the use of Summer school students taking courses in field botany and field zoölogy, sessions will continue until August 9th.

OKLAHOMA PHARMACY ALUMNI ELECT OFFICERS.

Jess W. Stunkle, of Enid, has been elected president of the Oklahoma Association of Graduate Pharmacists, to succeed Everett E. Duncan, who was recently elected president of the Oklahoma State Pharmaceutical Association.

Other officers are C. V. Nichols, of Anadarko, and Leonard Reynolds, of Tulsa, *Vice-Presidents;* Mrs. J. E. Wyly, Spavinaw, *Secretary*, and Guy Scroggs, Tulsa, *Treasurer*.

Members of the executive council are the officers and Miss Ina Griffith, Apache; James Hamilton, Holdenville; R. H. Mays, Duke; E. E. Duncan, Oklahoma City; G. M. Pearce, Drumright; Harlan Fuller, Minco, and John Helvey, Lawton.

THE COPELAND BILL.

The Senate passed the Copeland Bill. It has been referred to the Interstate and Foreign Commerce Committee of the House of which Congressman Sam Rayburn is the chairman. The latter has stated that if no substantial opposition to the bill develops, the committee will take it up.

HOTEL RATES AT PORTLAND.

The rate at Multnomah for one person is $2.50 and up, shower bath; tub $5.00; two persons, $4.00 and $8.00. The Imperial has a

rate from $1.50 up. Garage service $3.00 per week. Among other large hotels are: Benson, Carlton, Congress, Heathman, Mallory, New Heathman and Portland.

James L. O'Neill, a vice-president of the Guaranty Trust Company of New York, has assumed the office of Administrator of the new NRA. He started work as an office boy with Bradstreet, for twenty-two years he was with Carnegie Steel Company and became associated with the Guaranty Trust Company in 1918.

NOTICE TO CONTRIBUTORS TO THE JOURNAL AMERICAN PHARMACEUTICAL ASSOCIATION.

The following notice has been prepared from comments received from members of the Board of Review of Papers and of the Publication Committee.

Manuscripts should be sent to Editor E. G. Eberle, 2215 Constitution Ave., N. W., Washington, D. C.

All manuscripts should be typewritten in double spacing on one side of paper $8^1/_2$ x 11 inches, and should be mailed in a flat package—not rolled. The original (*not* carbon) copy should be sent. The original drawings, not photographs of drawings, should accompany the manuscript. Authors should indicate on the manuscript the approximate position of text figures. All drawings should be marked with the author's name and address.

A condensed title running page headline, not to exceed thirty-five letters, should be given on a separate sheet and placed at the beginning of each article.

The method of stating the laboratory in which the work is done should be uniform and placed as a footnote at end of first page, giving Department, School or College. The date when received for publication should be given.

Numerals are used for figures for all definite weights, measurements, percentages, and degrees of temperature (for example: 2 Kg., 1 inch, 20.5 cc., 300° C.). Spell out all indefinite and approximate periods of time and other numerals which are used in a general manner (for example: one hundred years ago, about two and one-half hours, seven times).

Standard abbreviations should be used whenever weights and measures are given in the metric system, *e. g.*, 10 Kg., 2.25 cc., etc. The forms to be used are: cc., Kg., mg., mm., L. and M.

Figures should be numbered from 1 up, beginning with the text-figures (line engravings are always treated as text-figures and should be designated as such) and continuing through the plates. The reduction desired should be clearly indicated on the margin of the drawing. All drawings should be made with India ink, preferably on white tracing paper or cloth. If coördinate paper is used, a blue-lined paper must be chosen. Usually it is desirable to ink in the large squares so that the curves can be more easily read. Lettering should be plain and large enough to reproduce well when the drawing is reduced to the width of a printed page (usually about 4 inches). Photographs intended for half-tone reproduction should be securely mounted with colorless paste.

"Figure" should be spelled out at the beginning of a sentence; elsewhere it is abbreviated to "Fig.;" per cent—2 words.

The expense for a limited number of figures and plates will be borne by the JOURNAL; expense for cuts in excess of this number must be defrayed by the author.

References to the literature cited should be grouped at the end of the manuscript under the *References*. The citations should be numbered consecutively in the order of their appearance (their location in the text should be indicated by full-sized figures included in parentheses). The sequence followed in the citations should be: Author's name (with initials), name of publication, volume number, page number and the date in parentheses. Abbreviations for journals should conform to the style of *Chemical Abstracts*, published by the American Chemical Society.

(1) Author, A. Y., *Am. J. Physiol*, 79, 289 (1927).

Papers presented at the Sections of the AMERICAN PHARMACEUTICAL ASSOCIATION'S annual meeting become the property of the ASSOCIATION and may at the discretion of the Editor be published in the JOURNAL. Papers presented at these Sections may be published in other periodicals only after the release of the papers by the Board of Review of Papers of the JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.

The Editor will appreciate comments from Board of Review and Committee on Publication, members, authors and others interested.